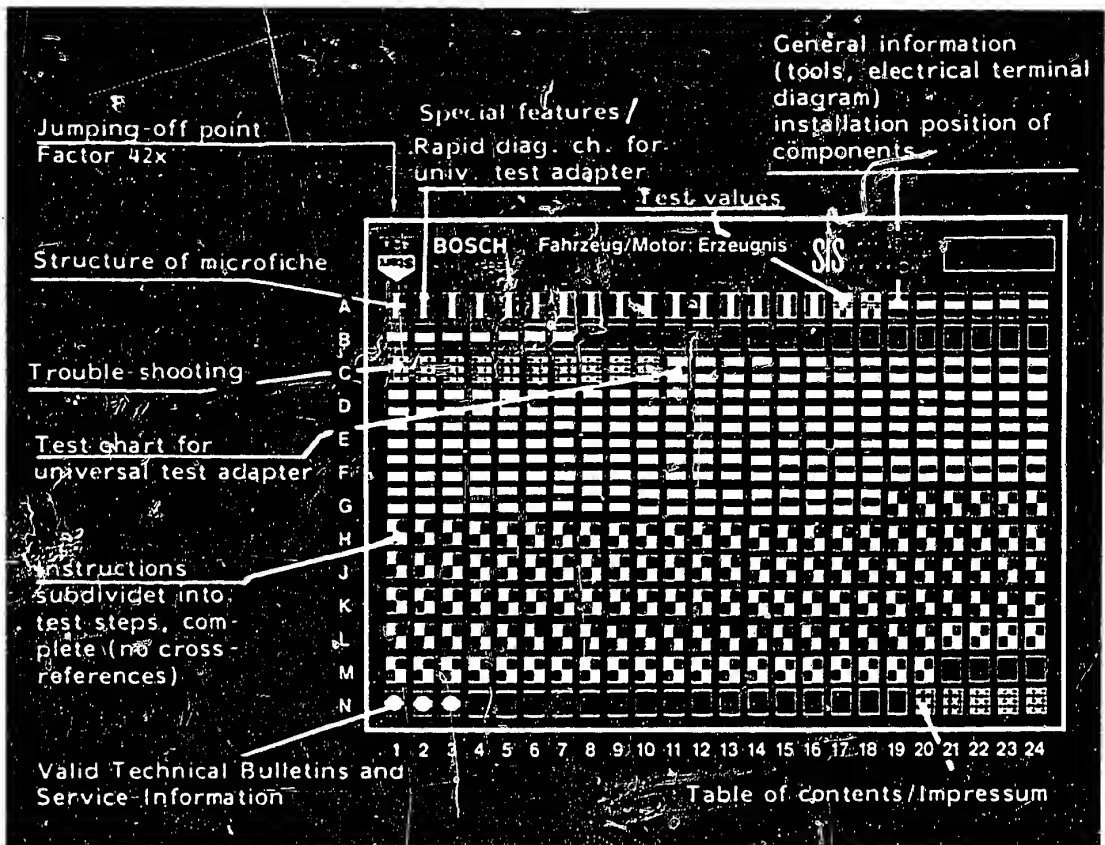


## Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

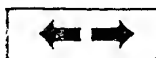
<b>E16</b>	Product/component/test step
	Vehicle/engine

Coordinate

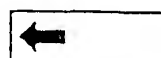
3. Limits of section



Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

**C6**

**A1**

Trouble-shooting program



## SPECIAL FEATURES

This microfiche card contains the testing and repair instructions for the Motronic in the

- BMW 325e for the USA, with a 2.7 l/6-Cyl. engine (12.83 →)

### 1. RAPID DIAGNOSTIC CHART FOR THE UNIVERSAL TEST ADAPTER

The rapid diagnostic chart that follows makes it possible for the experienced Motronic expert to check quickly the electrical portion of the system using the universal test adapter.

The rapid diagnostic chart contains the following information:

- Switch settings on the universal test adapter
- Sequence of test steps
- Notes on the operation of the universal test adapter or other components
- Reading on the multimeter and motortester
- Cross-references to coordinates for the pertinent detailed testing and trouble-shooting program.












If detailed instructions and information are required, proceed in principle according to the trouble-shooting chart starting from Coordinate C 1.

**A2**

Rapid diag. chart for univ. test adapter  
BMW 325e (USA)



# Rapid diagnostic chart for the universal test adapter

Test step	Switch setting		Notes	Test specification (reading)	For troubleshooting, see Coordinates
	V	$\Omega$			
1		1	Shift into neutral, ignition off. Disconnect control unit and pump relay. Measure insulation resistance of the rotational-speed sensor Term. 8 to Term. 5.	greater than 1 M $\Omega$	C 18
2		2	Measure insulation resistance of the reference mark sensor Term. 25 to Term. 5.	greater than 1 M $\Omega$	C 23
3		3	Measure coil resistance of the rotational-speed sensor Term. 8 to Term. 27	0.6 ... 1.6 k $\Omega$	D 3
4		4	Measure coil resistance of the reference mark sensor Term. 25 to Term. 26.	0.6 ... 1.6 k $\Omega$	D 7
5		5	Measure the resistance of the temperature sensor, engine (NTC II), Term. 13 to Term. 5.	at +15°C to +30°C: 1.3 ... 3.6 k $\Omega$ (dependent on temperature)	D 11
6		6	Measure resistance of the temperature sensor, air (NTC I) Term. 22 to Term. 5.	at +15°C to +30°C: 1.45 ... 3.3 k $\Omega$ (dependent on temperature)	D 13
7		7	Measure the resistance of the map switch Term. 10 to Term. 5.	less than 10 $\Omega$	D 15
8		8	not used	---	--
9		9	Accelerator pedal is at rest position. Measure resistance of the idle contact Term. 2 to Term. 5.	less than 10 $\Omega$	D 17
10		10	Step all the way down on the accelerator. Measure the resistance of the idle contact Term. 3 to Term. 5.	less than 10 $\Omega$	D 21
11		11	Measure the resistance. Ground Term. 16 to Term. 5	less than 10 $\Omega$	D 23

**A3**

Rapid diag. chart for univ. test adapter  
BMW 325e (USA)



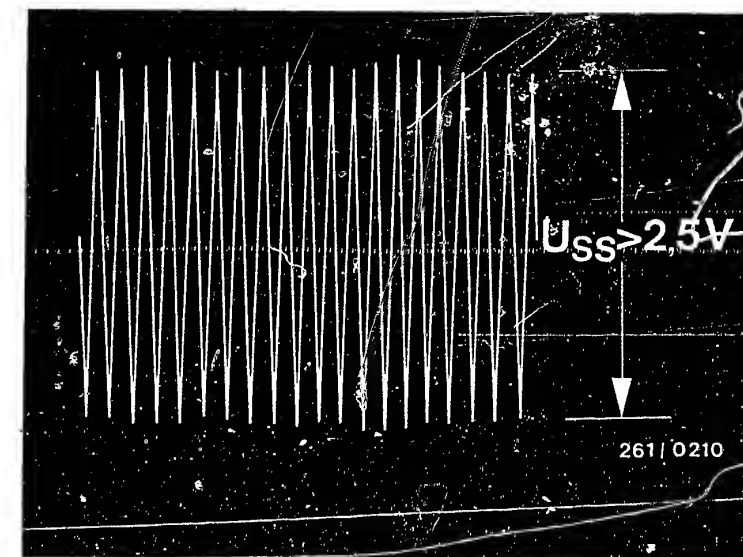
**A4**

Rapid diag. chart for univ. test adapter  
BMW 325e (USA)



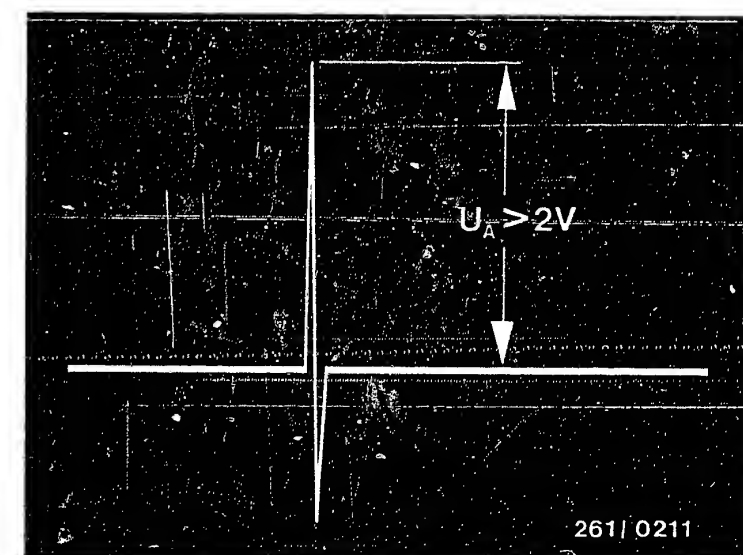
# Rapid diagnostic chart for the universal test adapter (continued)

Test step	Switch setting		Notes	Test specification (reading)	For troubleshooting, see Coordinates
	V	$\Omega$			
12	↓	12	Measure resistance. Ground, Term. 17 to Term. 5	less than 10 $\Omega$	E 1
13	↓	13	Measure resistance. Ground Term. 19 to Term. 5	less than 10 $\Omega$	E 3
14	↓	14	Measure resistance of the altitude sensor (pressure sensor), Term. 30 to Term. 5	0.4 ... 2.3 k $\Omega$ dependent on altitude	E 5
15	↓	14	Caution! Measure voltage of the altitude sensor (pressure sensor) at the $\Omega$ - sockets! Test specifications depend on altitude and battery voltage! Battery voltage between 10 and 14 V. Measurement at Term. 30 and Term. 5. Switch on the ignition.	0 m: 1.5... 3.5 V 500 m: 2.5... 5 V 1000m: 3.5... 6 V 1500m: 4.5... 7.5 V	E 7
16	1	15	Measure signal with oscilloscope, rotational-speed sensor Term. 8 to Term. 27. Shift into neutral and start the engine.	see figure at top	E 9
17	2	15	Measure signal with oscilloscope on the reference mark sensor Term. 25 to Term. 26. Shift into neutral and start the engine.	see figure at bottom	E 13



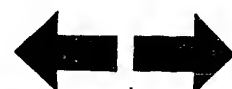
Rotational-speed sensor signal

Reference mark sensor signal.  
The positive peak must come first.



**A5**

Rapid diag. chart for univ. test adapter  
BMW 325e (USA)



**A6**

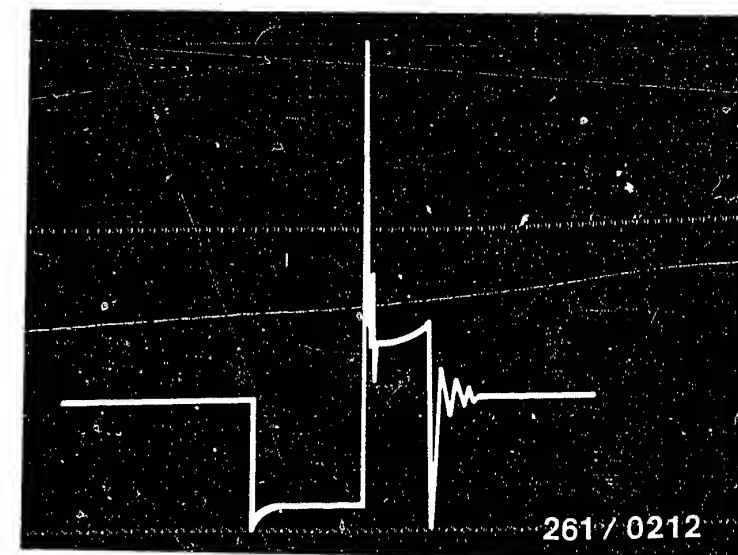
Rapid diag. chart for univ. test adapter  
BMW 325e (USA)





Rapid diagnostic chart for the universal test adapter (continued) Control unit 0 261 200 021

Test step	Switch setting		Notes	Test specifications (reading)	For troubleshooting, see Coordinates
	$\nabla$	$\Omega$			
18/19	3/4	15	not used	-----	-----
20	6	15	Measure voltage from the main relay at Term. 35 to Term. 5.	<u>10 ... 15 V</u>	E 17
21	7	15	Measure voltage from the main relay at Term. 18 to Term. 5.	<u>10 ... 15 V</u>	E 19
22	5	15	Ignition off. Connect the control unit. Ignition on. Measure the ignition signal with the oscilloscope. Shift into neutral and start the engine. Control unit, ignition output stage, Term. 1 to Term. 5. Evaluation: Signal present.	see figure	E 21



Ignition signal

**A7**

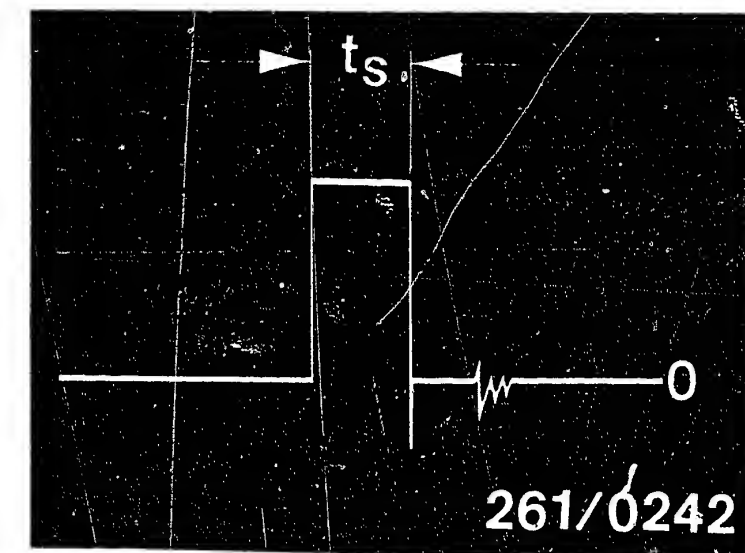
Rapid diag. chart for univ. test adapter  
BMW 325e (USA)



**A8**

Rapid diag. chart for univ. test adapter  
BMW 325e (USA)

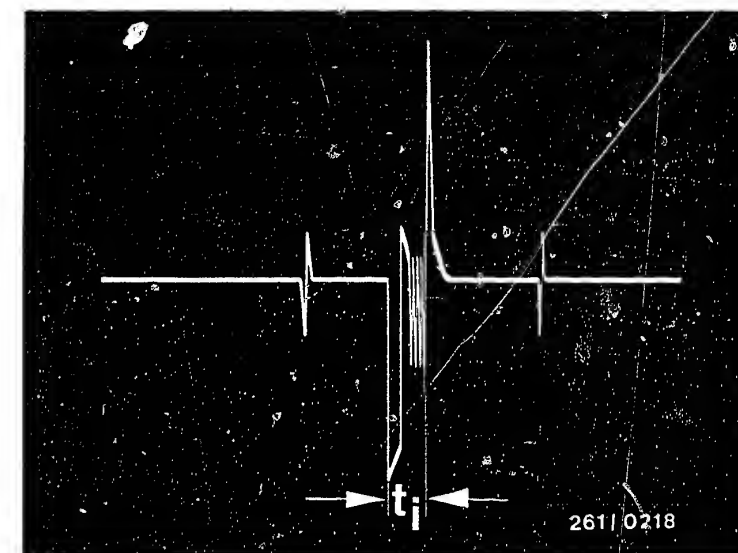



 $t_s$  = dwell period signal

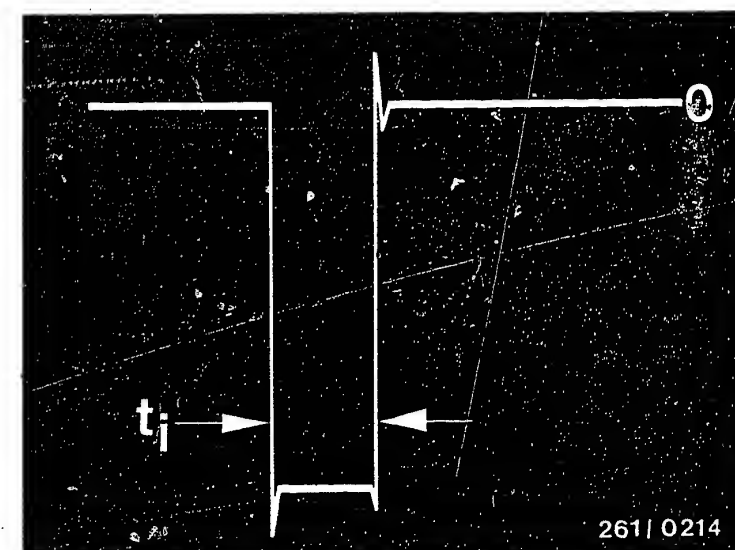
Test step	Switch setting		But-ton	Notes	Test speci-fications (reading)	For trouble-shooting, see Coor-dinates
	V	$\Omega$				
23	8	15		Measure voltage at the control unit Term. 9 to Term. 5.	greater than 8 V	E 23
24	9	15		Measure voltage from the air-flow sensor at Term. 7 to Term. 5.		
				Air-flow sensor flap in at rest position:	150 ... 250 mV	F 1
				Air-flow sensor flap open:	greater than 7V	
25/26	10/11	15		not used	-----	-----
27	12	15		Measure voltage. Starting signal Term. 50. Term. 4 to Term. 5	8 ... 15 V	F 3
28	13	15		Check the dwell period signal $t_s$ on the control unit using an oscilloscope. Term. 21 to Term. 5. Shift into neutral and start the engine.	see the figure	F 5



Test step	Switch setting		But-ton	Notes	Test spec-ifications (reading)	For trouble-shooting, see Coor-dinates
	V	$\Omega$				
29	14	15		Check the fuel-injection signal $t_i$ from the control unit using an oscilloscope, Term. 14 to Term. 5. Shift into neutral and start the engine.		F 7
30	14	15	T1	Like 29, but duration of injection comes somewhat broader after the but-ton is pressed (NTC II, cold).	see figure at top	F 9
31	15	15		Like test step 29, but check Term. 15 to Term. 5.		F 11
32	16	15		Measure the fuel-injection signal $t_i$ from the control unit using an oscil-loscope, Term. 11 to Term. 5. Shift into neutral and start the engine.	see figure at bottom	F 13



$t_i$  = Fuel-injection signal



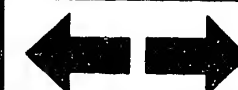
**A11**

Rapid diag. chart for univ. test adapter  
BMW 325e (USA)



**A12**

Rapid diag. chart for univ. test adapter  
BMW 325e (USA)



Rapid diagnostic chart for the universal test adapter (continued) Control unit 0 261 200 021

Test step	Switch setting		But-ton	Notes	Test specifications (reading)	For trouble-shooting, see Coor-dinates
	V	$\Omega$				
33	17	15		Plug in the pump relay. Measure the voltage at the pump relay at Term. 20 to Term. 5. Ignition on.	10 ... 15 V	F 15
34	17	15		Measure voltage. Shift into neutral and start the engine. Control unit, pump control active Term. 20 to Term. 5.	max. 4 V	F 17
35	17	15	T3	Ignition off. Connect pressure gauge. Ignition on. Press T3. Take reading for fuel pressure.	2.3 ... 2.7 bar	F 19
36	17	15		Connect diagnosis cable and motortester. Connect CO-tester before catalytic converter. Disconnect tank vent hose. Have engine run. Check idle speed and CO	650 ... 750 min <sup>-1</sup> 0.5 ... 0.8 vol. %CO	G 1
	17	15	T2	As above, values unchanged!		
37	17	15		Have engine run. Check timing at idle speed. Important! Idle speed must be between 650 and 750 min <sup>-1</sup> or other timing angles will be obtained! If idle speed fluctuates, the timing also fluctuates.	3° ... 13° at idle speed	G 6
	17	15	T6	Check timing at full load. Set engine speed at 2700 min <sup>-1</sup> press button T6 (full-load button). For testing, cool the engine with an auxiliary fan, because the timing is retarded as the air-intake temperature rises (starting from +30°C).	9° ... 15° at an engine speed 2700 min <sup>-1</sup> and max. air-intake temperature +30°C.	G 6
38	17	15		Dwell angle at idle speed	6° ... 18°	
				Dwell angle at 3000 min <sup>-1</sup>	22° ... 42°	G 8
39	17	15	T5	Hold engine speed constant at 2000 min <sup>-1</sup> . Press button T5. Fuel-injection signals discontinue, and return at approx. 1200 min <sup>-1</sup> .	Engine "hunts"	G 10

**A13**

Rapid diag. chart for univ. test adapter  
BMW 325e (USA)



**A14**

Rapid diag. chart for univ. test adapter  
BMW 325e (USA)



Rapid diagnostic chart for the universal test adapter (continued) Control unit 0 261 200 021

Test step	Switch setting		But-ton	Notes	Test specifications (reading)	For trouble-shooting, see Coor-dinates
	V	Ω				
40/41	18/19	15		not used	-----	-----
42	20	22		Disconnect tank vent hose. Measure CO before the catalytic converter. Lambda closed-loop control "rich" stop, Term. 24 from control unit to ground	CO rises above 3.5 vol. %. After approx. 10 s, CO-level drops off again.	G 12
43	20	23		Measure CO before the catalytic converter. Lambda closed-loop control "lean" stop, Term. 24 from the control unit to + 2 V.	CO drops below 0.5 vol. %, engine runs rough. After approx. 10 s the CO-level rises again.	G 14
44	20	24		Measure CO before the catalytic converter. Lambda closed-loop control operation. Term. 24 from the control unit connected with the lambda sensor. After completion of the test, reconnect the tank vent hose	CO = <u>0.5</u> ... 0.8 vol. %	G 16

**A15**

Rapid diag. chart for univ. test adapter  
BMW 325e (USA)



**A16**

Rapid diag. chart for univ. test adapter  
BMW 325e (USA)



## 2. TEST SPECIFICATIONS

**C7**

Idle speed

650 ... 750 min<sup>-1</sup>

Exhaust gas setting  
CO-level with engine  
at normal operating  
temperature:

0.5 ... 0.8 vol. %CO

Fuel pressure

2.3 ... 2.7 bar

Fuel pump delivery:

min. 750 cm<sup>3</sup>/30 s

For settings for ignition, valve clearance, and other engine data, see the Equipment and Autodata Microfiche.

Solenoid-operated fuel-  
injection valve:  
Internal electrical  
resistance

2 ... 3  $\Omega$

Air-flow sensor

Resistance between  
Term. 7 and Term. 6.

8  $\Omega$  ... 2500  $\Omega$

(Deflect air-flow sensor flap from at rest position to the full-load stop.)

Term. 9 and Term. 6:

500  $\Omega$  ... 1100  $\Omega$

Idle actuator  
(non-Bosch):

Internal electrical  
resistance

9 ... 10  $\Omega$

Lambda sensor

Resistance of the  
heating coil:

approx. 6 ... 20  $\Omega$

**C5****A17**

Test specifications  
BMW 325e (USA)



Temperature sensor I (NTC I, air):

Internal electrical resistance

at +15°C ... +30°C:

1.45 ... 3.3 kΩ

(measured on the air-flow  
sensor between Term. 22 and  
Term. 6)

At +80°C:

280 ... 360 Ω

Temperature sensor II (NTC II, coolant):

Internal electrical resistance

at +15°C ... +30°C):

1.3 ... 3.6 kΩ

at +80°C:

250 ... 390 Ω

Rotational-speed sensor and reference mark sensor

Internal electrical  
resistance:

0.6 ... 1.6 kΩ

Throttle valve switch (microswitch)

Resistance of  
idle contact (Term. 2  
and Term. 43):

0 Ω

Full-load contact  
(Term. 3 and Term. 43):

0 Ω

Start valve

Internal electrical  
resistance

approx. 4 Ω

Thermotimeswitch  
35° / 8 s:

Internal electrical resistance:

"G" and  
ground

"W" and  
ground

"G" and  
"W"

Ambient temp-  
erature (less than  
+ 30°C):  
engine at normal  
operating temp-  
erature (above  
+40°C):

25...40 Ω

0 Ω

25...40 Ω

50...80 Ω

100...160 Ω

50...80 Ω

Pressure sensor (altitude sensor)

Total resistance between Term. 3  
(+) and Term. 2 (-):

2.3...2.5 kΩ

Resistance between wiper  
Term. 1 (S) and Term. 2(-)

0.4...2.3 kΩ

(dependent on altitude)

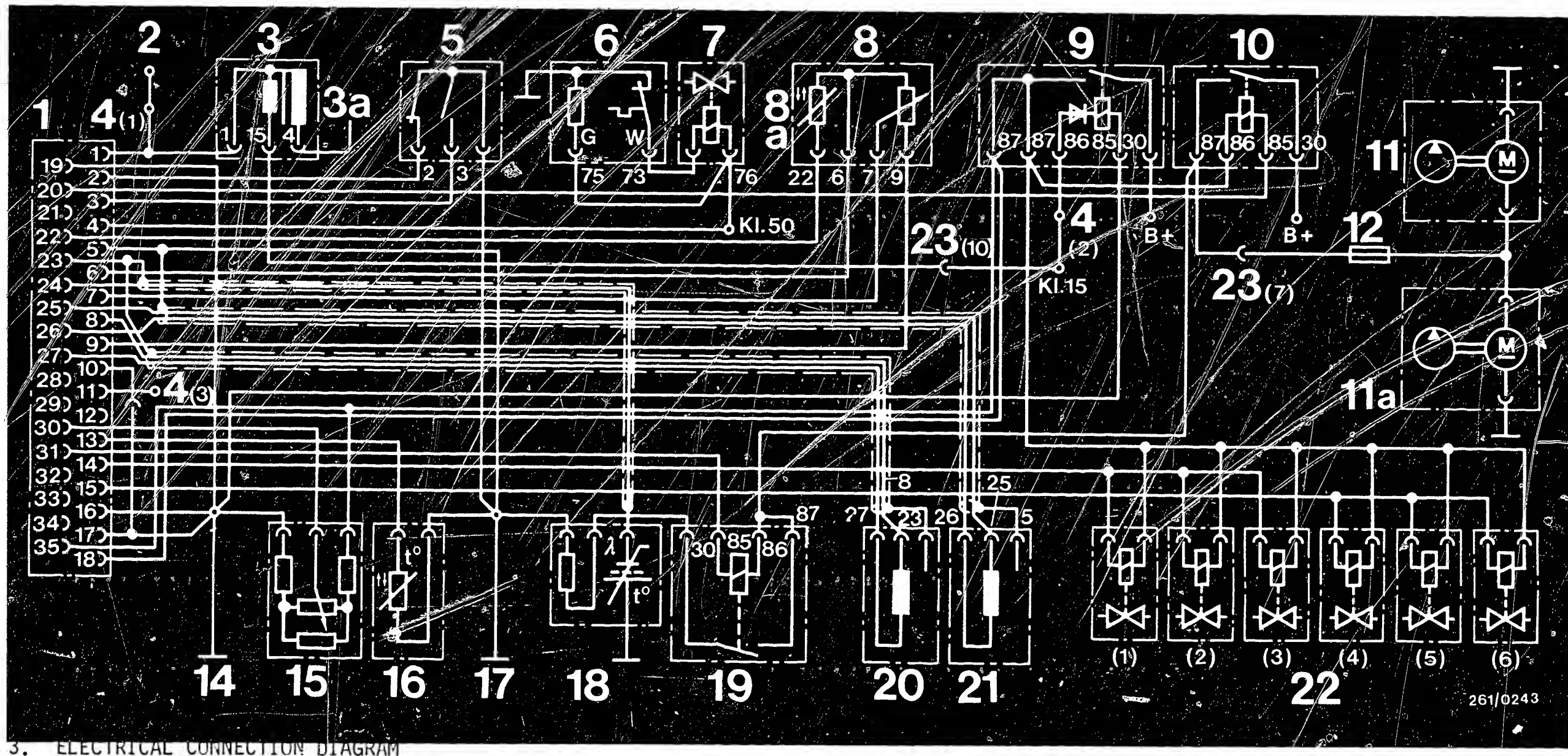
**A18**

Test specifications

BMW 325e (USA)







- 1 = Control unit plug
- 2 = to the diagnosis plug and tachometer
- 3 = Ignition coil
- 3a = to high-voltage distributor
- 4 = Plug connection (3-pole) in the glove compartment
- 5 = Throttle-valve switch
- 6 = Thermotime switch
- 7 = Start valve

- 8 = Air-flow sensor
- 8a = Temperature sensor I (air)
- 9 = Relay 2 (main relay with safety diode for incorrect polarity)
- 10 = Relay 1 (pump relay)
- 11 = Fuel pump
- 11a = Pre-supply pump
- 12 = Pump fuse F 11
- 14 = Vehicle ground for control unit output stage

- 15 = Altitude sensor
- 16 = Temperature sensor (coolant)
- 17 = Vehicle ground for control unit
- 18 = Lambda sensor (heated)
- 19 = Sensor heater relay
- 20 = Rotational-speed sensor
- 21 = Reference mark sensor
- 22 = Solenoid-operated fuel-injection valves
- 23 = Motor plug (No. 7, No. 10)

K1. = Term.

**A19**

Electrical connection diagram  
BMW 325 e (USA)

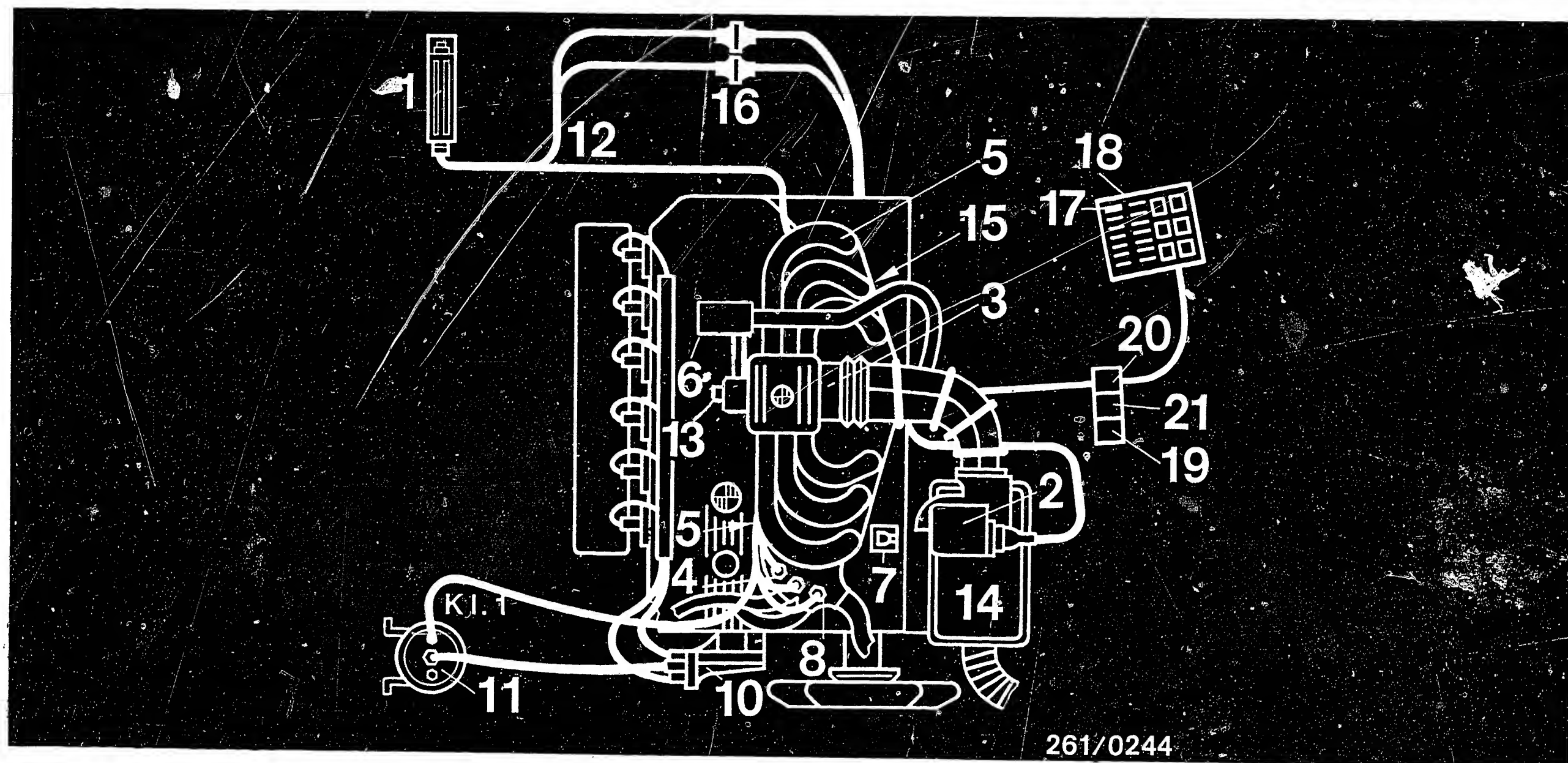


**A20**

Electrical connection diagram  
BMW 325 e (USA)



261/0243



3.1 Diagram of electrical leads and arrangement of the Motronic components

- |                                |                                       |                               |
|--------------------------------|---------------------------------------|-------------------------------|
| 1 = Control unit               | 10 = High-voltage distributor         | 17 = Pump fuse                |
| 2 = Air-flow sensor            | 11 = Ignition coil                    | 18 = Central electric box     |
| 3 = Throttle-valve switch      | 12 = Wiring harness                   | 19 = Relay 2 for control unit |
| 4 = Temperature sensor, engine | 13 = Start valve                      | 20 = Relay 1 for fuel pump    |
| 5 = Fuel-injection valve       | 14 = Air filter                       | 21 = Relay for sensor heater  |
| 6 = Idle actuator              | 15 = Central ground                   |                               |
| 7 = Diagnosis socket           | 16 = Plug connections for rotational- |                               |
| 8 = Thermotime switch          | speed and reference mark sensors      |                               |

**A21**

Electrical lead diagram

BMW 325e (USA)

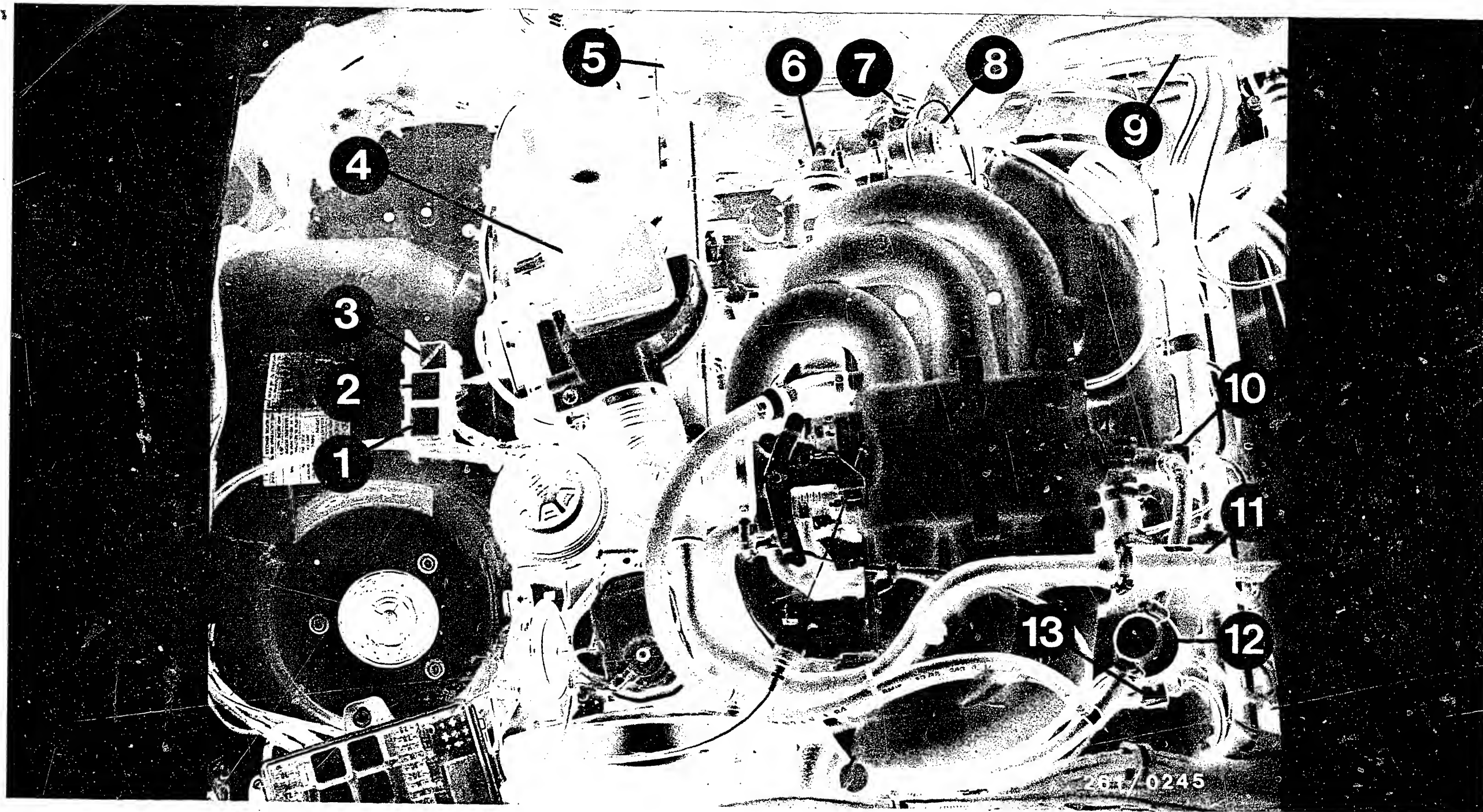


**A22**

Electrical lead diagram

BMW 325e (USA)





#### 4. INSTALLATION POSITION OF THE COMPONENTS

- 1 = Pump relay
- 2 = Relay for sensor heater
- 3 = Main relay
- 4 = Air-flow sensor
- 5 = Altitude sensor (pressure sensor)

- 6 = Fuel-line-pressure damper  
in the return
- 7 = Thermotime switch
- 8 = Pressure regulator
- 9 = High-voltage distributor

- 10 = Start valve
- 11 = Idle actuator
- 12 = Fuel-line-pressure damper  
in the delivery line (not in the  
standard model)
- 13 = Plug connection for the sensors

**A23**

Installation position of the components  
BMW 325e (USA)



**A24**

Installation position of the components  
BMW 325e (USA)



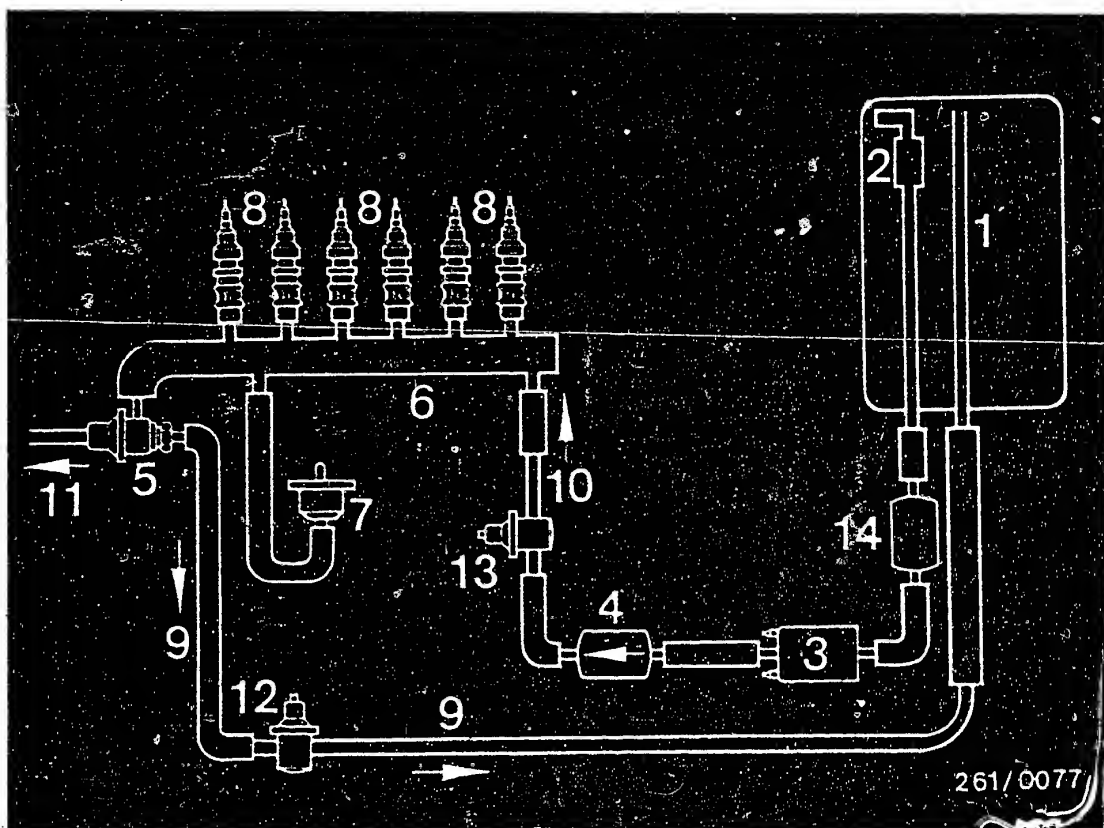
## Installation position of the components (continued)

Indications for installation position are always based on the direction of forward vehicle travel. The list below is of those components that are not visible in the picture.

Reference mark and rotational-speed sensors:	In the starting motor ring gear housing on the circumference of the ring gear.
Fuel filter:	On the left in the engine compartment, near the bulkhead
Fuel pump:	On the left under the vehicle, near the fuel tank
Ground lead for the electric fuel pump:	On the left under the rear bench seat (well). Ground point on the vehicle body.
Control unit:	Behind the cover in the glove compartment.
Temperature sensor I (air):	In the air-flow sensor
Temperature sensor II (engine):	In front of the intake manifold, near the fan.
Central ground:	On the intake tube of the fifth cylinder







## 5. FUEL LINE DIAGRAM

- 1 = Fuel tank
  - 2 = Fuel pre-supply pump (in the tank)
  - 3 = Electric fuel pump
  - 4 = Fuel filter
  - 5 = Pressure regulator
  - 6 = Fuel distribution pipe
  - 7 = Start valve
  - 8 = Solenoid-operated fuel-injection valve
  - 9 = Fuel return line
  - 10 = Fuel delivery line
- Fuel delivery and return lines run on the underside of the vehicle, on the left.
- 11 = To the intake manifold
  - 12 = 1st fuel-line-pressure damper
  - 13 = 2nd fuel-line-pressure damper (not in the standard model)
  - 14 = Fuel spinner

## 6. TEST EQUIPMENT AND TOOLS

<u>Name</u>	<u>Designation</u>	<u>Part No.</u>
Universal test adapter Adapter lead, USA/Japan	ETT 018.01	0 684 101 801 1 684 463 128
Motortester	e.g. MOT 201	0 684 000 201
Diagnosis cable for measurement of timing angle		1 684 463 095
Exhaust gas tester	e.g. ETT 008.02 or ETT 008.03	0 684 100 802 0 684 100 803
Multimeter (min. internal resistance 20 k $\Omega$ /V)		commercially available e.g., Metra- watt GmbH Type MA2H or Fluke Multi- meter 75 or 77
Pressure gauge 6 bar  or pressure tester or pressure tester (no longer available)  Three-way line as connection for KDJE-P 100 and KDEP 1034	Quality class 1.0 Graduation 0.1 bar	1 687 231 154  KDJE-P 100  KDEP 1034  KDJE-P 100/13



<u>Name</u>	<u>Part Number</u>
Feeler gauge for measuring the sensor air gaps (up to 1 mm)	commercially available
Lubricant for rotational-speed and reference mark sensors	Molykote Longterm 2 commercially available
Chassis dynamometer, e.g. LPS 96 or LPS 002	0 680 017 001 0 680 100 200
Test lead 2-pole, for measuring resistances and signals, e.g., on fuel-inject- ion valves	1 684 463 093
Test leads for proper connection of test equip- ment to component plugs	KDZS 0004 (2.8 mm wide) KDZS 0005 (6.3 mm wide)

For USA/Japan:

Tool kit for removing and putting on the idle-CO anti-  
tamper device for the air-flow sensor, e.g., No. 13  
1090 from Cartool

Hans Schubert KG  
Unterer Grasweg 88  
D - 8070 Ingolstadt

or from BMW of America

Mounting paste VS 14016 Ft for the lambda sensor and the exhaust gas screw plug	5 960 080 105
Clamp to crimp off fuel and air hoses	commercially available

**B4**

Test equipment and tools  
BMW 325e (USA)





## 7. IMPORTANT GENERAL INSTRUCTIONS

Be absolutely certain to follow instructions in order to avoid damage to the engine, the control unit, or the ignition coil and to prevent endangering human life.

- Never start the engine unless the battery is firmly connected.
- Incorrect polarity or supply voltage, e.g., due to incorrect connection of the battery or ignition coil, can destroy the control unit.
- Do not use a quick charger to start the engine.

Provide starting assistance only with a second 12 V battery and a starting assistance cable.

### Caution!

Due to differing requirements from vehicle manufacturers for electronic products, we recommend not using any batteries with 24 V for starting assistance. Follow the operating instructions for the vehicle.

- Separate the battery from the vehicle electrical system before quick charging.
- When charging the battery in the vehicle, or during starting assistance, follow instructions in the operator's handbook for the quick-charger and instructions from the vehicle manufacturer.
- Never disconnect the battery from the vehicle electrical system with the engine running.
- Do not short-circuit ignition coil Term. 1 to ground (e.g., to shut off the engine). The ignition coil and under some circumstances the control unit are destroyed.



- Never connect the positive terminal of the battery to ignition coil Term. 1. The control unit is destroyed.
- Never connect or disconnect the wiring harness plug of the control unit while the ignition is on.
- At temperatures above +80°C (paint-drying ovens), remove the control unit.
- During welding work (electrical spot welding), the control unit must be taken out.
- Disconnect relay set for compression pressure test. This prevents unwanted fuel injection from the fuel-injection valves.
- When installing an alarm system, follow the instructions in the installation instructions for Motronic vehicles or the after-sales service instruction SIS-A11-500.
- In this connection, there must be assurance that the alarm relay is not subject to interference from outside fields (e.g. from ignition leads), causing false alarms.

### C A U T I O N !



High energy  
ignition system, dangerous  
primary and secondary voltages!



The sticker shown means the following:

The Motronic contains a high energy ignition system which can be extremely hazardous if one touches parts or terminals that are live (both on the primary and on the secondary sides).

In this connection, we call your attention to the fact that when working or testing on the ignition system, the VDE regulations, particularly VDE 0104/7.67, are to be followed.

Basically, when working on the ignition coil, switch the ignition off. (Switch off the ignition or source of electricity.)

Such work includes, for example:

Connecting motortesters (timing strobe, a tact-dwell tester, an ignition oscilloscope, etc.).

Taking out and replacing parts of the ignition system (spark plug, ignition coil, high-voltage distributor, ignition cable, etc.).

If it is necessary to switch the ignition on (connect up the ignition or the source of electricity) during testing on the ignition system or during adjustment on the engine, then the dangerous voltages mentioned are present on the entire system.

That means, the risk of an accident is present not only at the individual components of the ignition system (such as, for example, the high-voltage distributor, the ignition coil, the control unit, and the ignition harness), but also on the wiring harness (such as, for example, the tachometer connection, the diagnosis plug), on plug connections, and on testing equipment.



## 8. TROUBLE SHOOTING

The purpose of the trouble-shooting programs below is to make it possible, when used in conjunction with the universal test adapter and other suitable test equipment, for the workshop employees to identify quickly the causes of defects on the Motronic. A selection can be made between the job procedures below, depending on the training and the experience of the mechanic.

- Detailed, step-by-step trouble-shooting  
for employees with little experience and practice on vehicles with the Motronic
- Targeted trouble-shooting, leading directly to the cause of the defect  
for trained and experienced employees with a fairly large amount of practice on vehicles with the Motronic.

**C3**

**C5**

Both trouble-shooting programs start with checking the electrical/electronic portion of the Motronic using the universal test adapter ETT 018.01. With this, the electrical function of the wiring harness and the components connected to it (including the control unit) are checked quickly and defects are quickly identified.

If no defect is found using the universal test adapter, it is necessary to continue with the detailed or the targeted trouble-shooting.

**C1**

Trouble-shooting  
BMW 325e (USA)



**C2**

Trouble-shooting  
BMW 325e(USA)



## 8.1 Detailed, step-by-step trouble-shooting

### 8.1.1 Testing with the universal test adapter

Be absolutely certain to start the testing program with this test, and to run this test from the start through to end.

### 8.1.2 Trouble-shooting according to customer complaints (defect symptoms)

The table below contains possible defect symptoms and, next to them in the column at the right, the initial coordinates for the pertinent detailed trouble-shooting program.

This program consists of test steps in a reasonable sequence for all individual components of the Motronic.

If the defect has not been identified and corrected after conclusion of the trouble-shooting program for an assumed defect symptom, a new defect symptom must be selected to determine a new program, and that program must be worked through.

<u>Customer complaints (defect symptoms)</u>		<u>Testing with universal test adapter</u>	<u>Coordinates</u>
1. Engine does not start or starts only with difficulty		C 11	G 19
2. Engine starts and then dies		C 11	H 17
3. Rough idle and/or incorrect idle speed		C 11	J 5
4. Poor throttle take-up		C 11	J 21
5. Engine missing in all driving conditions		C 11	K 13
6. Poor mileage		C 11	L 3
7. No max. engine power or max. velocity		C 11	L 17
8. CO-level too high or too low at idle		C 11	M 11
<b>C3</b> Trouble-shooting BMW 325e (USA)		<b>C4</b> Trouble-shooting BMW 325e (USA)	

## 8.2 Targeted trouble-shooting leading directly to the cause of the defect

### 8.2.1 Testing with the universal test adapter

Be absolutely certain to start the testing program with the test with the universal test adapter and run that test from the start through to end.

### 8.2.2. Trouble-shooting according to customer complaints

The table below contains various defect symptoms with several possible causes of defects in each instance. The cross-reference field indicates the initial coordinate for the test step on the pertinent individual component of the Motronic. If the defect has not been identified or corrected after completion of the test on the individual components, a new defect symptom must be determined.

#### Customer complaint (defect symptoms)

1. Engine does not start or starts only with difficulty								
2. Engine starts and then dies								
3. Rough idle, and/or incorrect idle speed								
4. Poor throttle take-up								
5. Engine missing in all driving conditions								
6. Poor mileage								
7. No max. engine power and/or max. velocity								
8. CO-level too high or too low at idle								
Cause (component defect)								
B11	B11	B11	B11	B11	B11	B11	B11	Testing with universal test adapter
●*)								Main or pump relay defective
●*)								Electric fuel pump defective
H3	K21	J11	K11					Idle speed control defective
		●*)				●*)		Throttle valve switch (idle and full-load contacts) defective
H13	J3	J7	K3	K17	L11	L21	M13	Air-flow sensor defective

Continued on C7/C8/C9/C10

C5

Trouble-shooting  
BMW 325e (USA)



C6

Trouble-shooting  
BMW 325e (USA)



# Customer complaints (defect symptoms)

1. Engine does not start or starts only with difficulty
2. Engine starts and then dies
3. Rough idle, and/or incorrect idle speed
4. Poor throttle take-up
5. Engine missing in all driving conditions
6. Poor mileage
7. No max. engine power and /or max. velocity
8. CO-level too high or too low at idle

Cause (component defect)

H13	H19	J9	K5			M9	M17	Leaks in intake system
G 2		J15			L11	L21		Solenoid-operated fuel-injection valves defective
●*)		●*)				M5		Fuel pressure too low or zero, pressure regulator is not functioning
		●*)			●*)		●*)	Fuel pressure too high, pressure regulator is not functioning
				K19		M3		Fuel delivery too low
	●*)				●*)		●*)	Temperature sensor I (air) or temperature sensor II (coolant) defective
						L19		Throttle valve is not opening completely
				K15				Poor central ground, loose contacts, defective plug connections
H13	H19	J9	K5			M9	M17	Breaks in the wiring harness and plug connections
H5								Start valve is not opening
	H23	J13			L9		H15	Start valve is not closing
H11	J1	J13						Thermotime switch is defective
		J19			L15		M19	CO-exhaust setting too rich
		J19	●*)				M19	CO exhaust setting too lean
		●*)	●*)		●*)		●*)	Altitude sensor defective

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Trouble-shooting  
BMW 325e (USA)



C8

Trouble-shooting  
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# Customer complaint (defect symptoms)

1.	Engine does not start or starts only with difficulty								
2.	Engine starts and then dies								
3.	Rough idle, and/or incorrect idle speed								
4.	Poor throttle take-up								
5.	Engine missing in all driving conditions								
6.	Poor mileage								
7.	No max. engine power and/or max. velocity								
8.	CO-level too high or too low at idle								
									Cause (component defect)
●*)									Rotational-speed sensor defective
●*)									Reference mark sensor defective
				L1					Check alternator, interference suppression devices
G21	J7	J23	K15	L7	L19	M13			Check secondary patterns
●*)	●*)	●*)	●*)	●*)	●*)	●*)	●*)		Control unit defective
	●*)						●*)		Check lambda closed-loop control

●\*) You have already checked these components if you have carried out the test with the universal test adapter.

Continue the testing with the next component in this column.

If however, you have reached this point via a complaint about a component or the table of test specifications, you must check this component with the universal test adapter.

The testing program for the test adapter begins at Coordinates C 11, and is to be run completely.

C9

Trouble-shooting  
BMW 325e (USA)



C10

Trouble-shooting  
BMW 325e (USA)



9. TESTING WITH THE UNIVERSAL TEST ADAPTER ETT 018.01  
(0 684 101 801) and the adapter lead for the Motronic  
(1 684 463 128)

Connect the universal test adapter to the Motronic wiring harness. (The ignition must be switched on.)

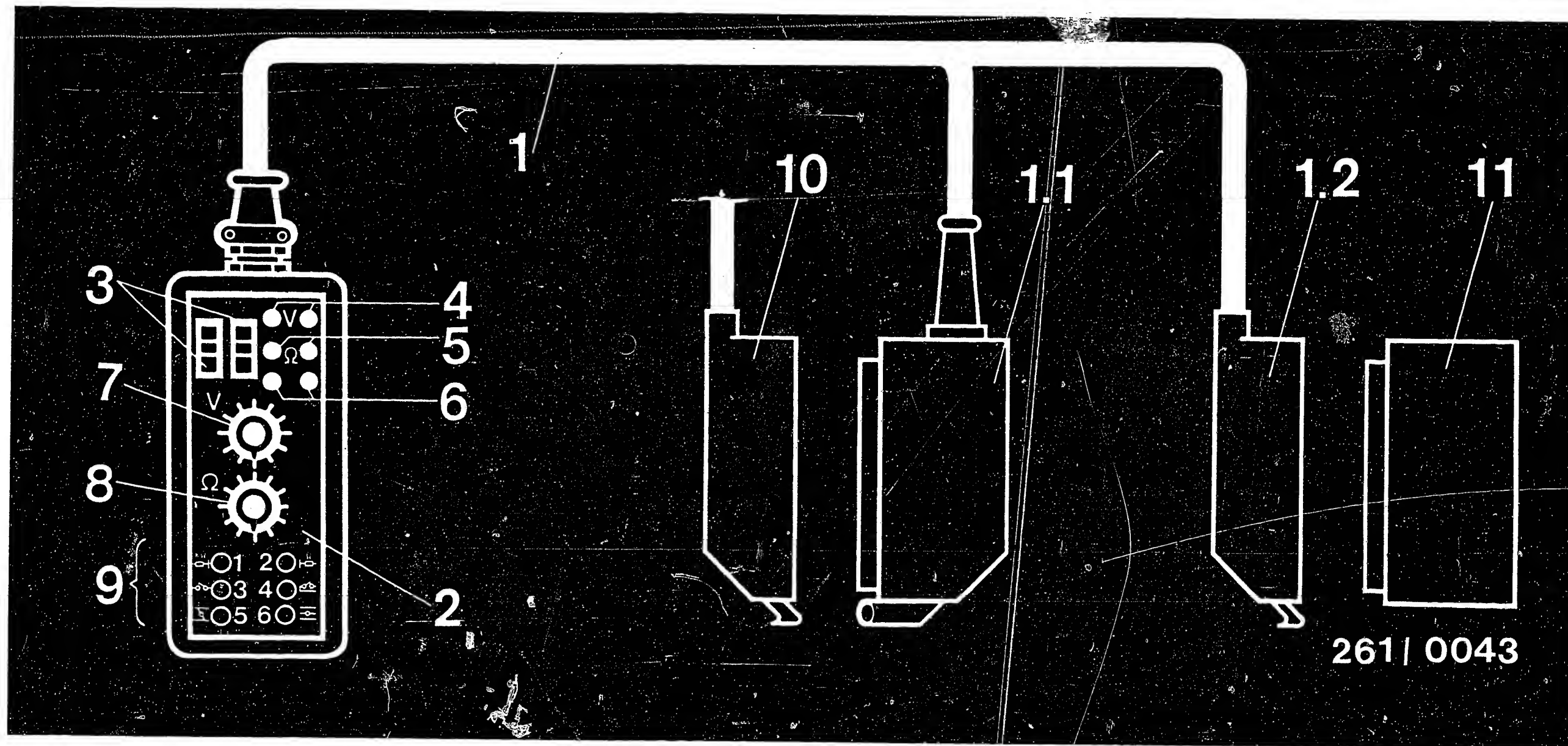
To test the wiring harness and the components connected to it, it is permissible to connect only the Motronic wiring harness, but not the control unit. Be absolutely certain to follow the instructions in the test chart.

A tester for measurement of voltage and resistance (multimeter) and a motortester are to be connected to the test adapter for taking measurements.

The individual test steps are selected using the program switch. The symbols "V" and " $\Omega$ " indicate to the operator whether voltage or resistance is being measured. Several switch settings are also required for simulation while the engine is running. By activating the buttons, with the control unit connected and the engine running, operating conditions can be changed, i.e. simulated, as desired. Thus, for example, when the engine is at normal operating temperature, an engine temperature of  $-20^{\circ}\text{C}$  can be simulated for the control unit by pressing button T 1, and the reaction of the control unit can be evaluated on the motortester.

If necessary, the wiring diagram can be used for troubleshooting.





Universal test adapter with adapter lead for Motronic

- 1 = Adapter lead
- 1.1 = Connection to the wiring harness
- 1.2 = Connection to the control unit
- 2 = Universal test adapter (Part No. 0 684 001 801)
- 3 = Test wells (for motortester)
- 4 = Test sockets (for measuring voltage)
- 5 = Test sockets (for measuring resistance)
- 6 = Test sockets (not assigned)
- 7 = Program switch "V"
- 8 = Program switch "Ω"

- 9 = Buttons to simulate operating conditions
- Button 1 = NTC II (engine), cold (-20°C)
- Button 2 = NTC II (engine), warm (+80°C)
- Button 3 = Triggering of pump
- Button 4 = Not assigned
- Button 5 = Throttle valve, idle contact
- Button 6 = Throttle valve, full-load contact
- 10 = Motronic wiring harness
- 11 = Control unit

**C12**

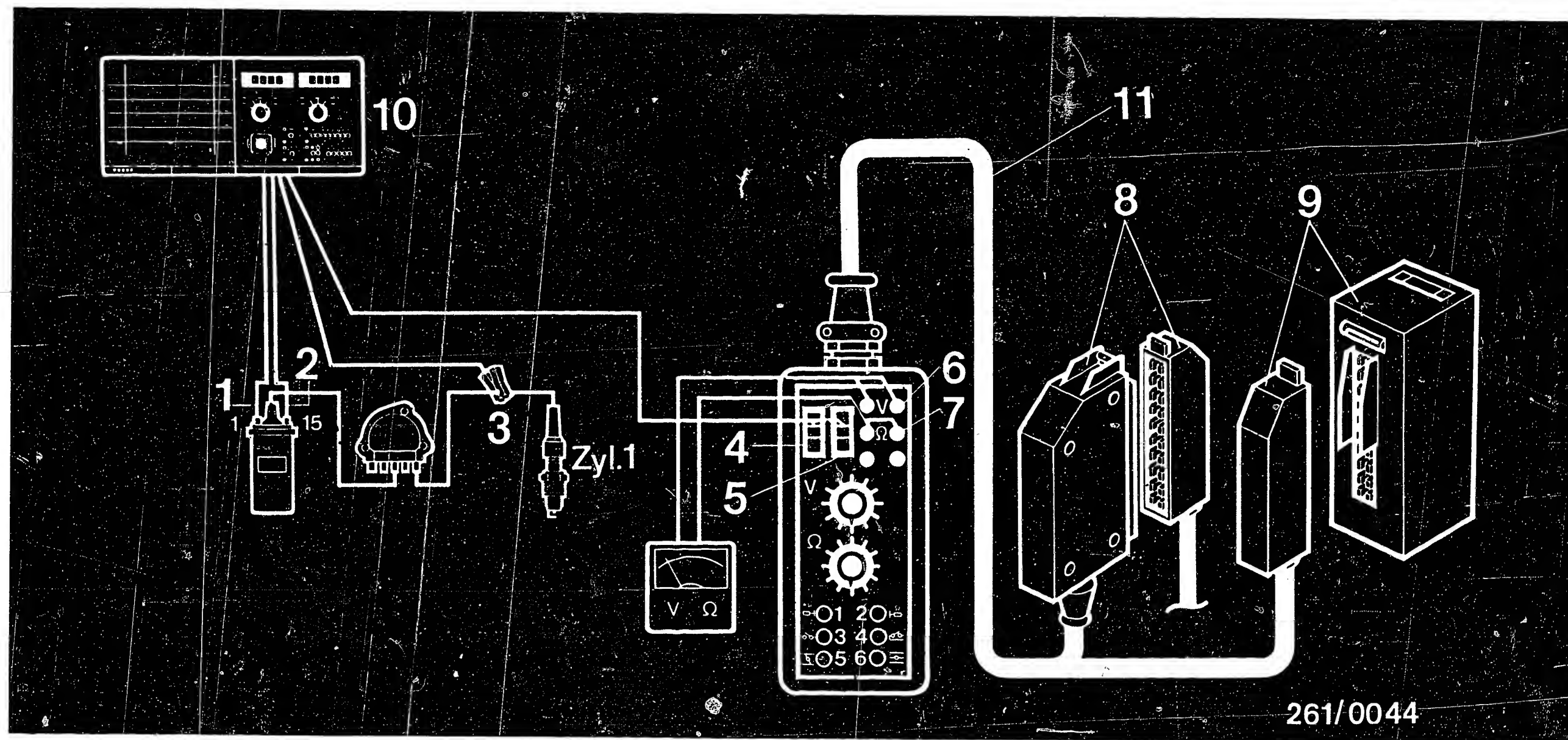
Testing with universal test adapter  
BMW 325e (USA)



**C13**

Testing with universal test adapter  
BMW 325e (USA)





Connection diagram for universal test adapter

- 1 = Green clip to ignition coil Term. 1
- 2 = Yellow clip to ignition coil Term. 15
- 3 = Clamp-on induction pick-up over the ignition cable of cylinder 1
- 4 = Red connection socket (test well) for the red terminal of the motortester
- 5 = Black connection socket (test well) for the black terminal of the motortester

- 6 = Connection of the voltmeter to V-sockets (red = +, black = ground or -)
- 7 = Connection of the ohmmeter to  $\Omega$  sockets (blue)
- 8 = Connection to the Motronic wiring harness
- 9 = Connection to the Motronic control unit
- 10 = Motortester
- 11 = Adapter lead for Motronic

**C14**

Testing with universal test adapter  
BMW 325e (USA)



**C15**

Testing with universal test adapter  
BMW 325e (USA)



### Preparation for testing with the universal test adapter

Take out the control unit and connect the test adapter.

Installation position of the control unit: Behind the cover in the glove compartment.

To take it out, the detent must be pressed back and the plug must be flipped up in the direction shown by the arrow and disconnected.

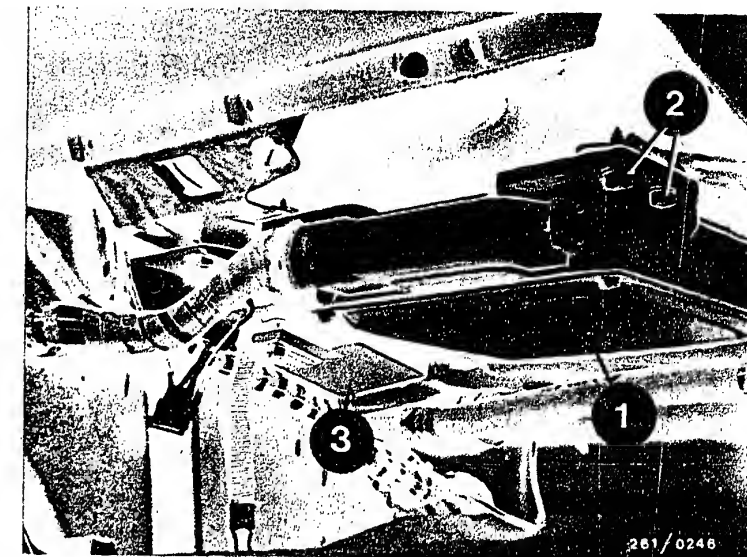
The control unit is fastened with 4 screws.

#### Note

In order to preclude confusing the control unit for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point when connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.

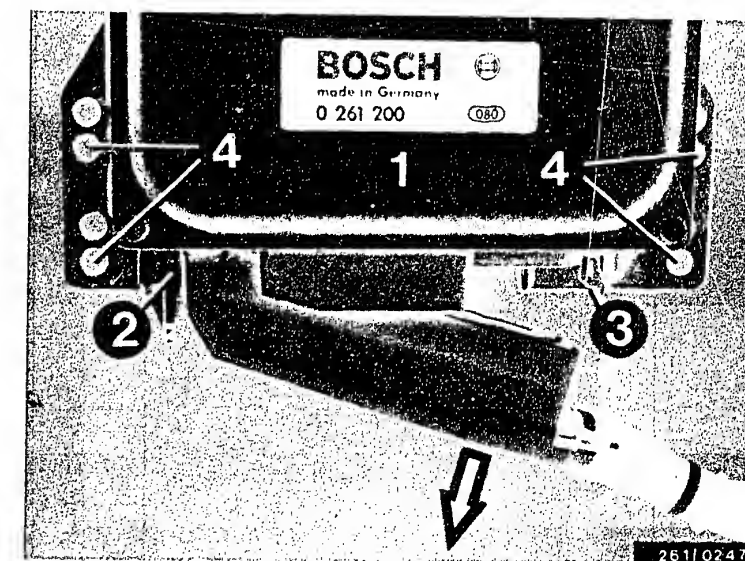
#### Note:

In the test steps that follow, a white border in the column "operation" indicates what operation is to be changed from the preceding test step.



- 1 = Control unit for Motronic
- 2 = Fastening screws
- 3 = Control unit for idle speed control

- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes



**C16**

Testing with universal test adapter  
BMW 325e (USA)




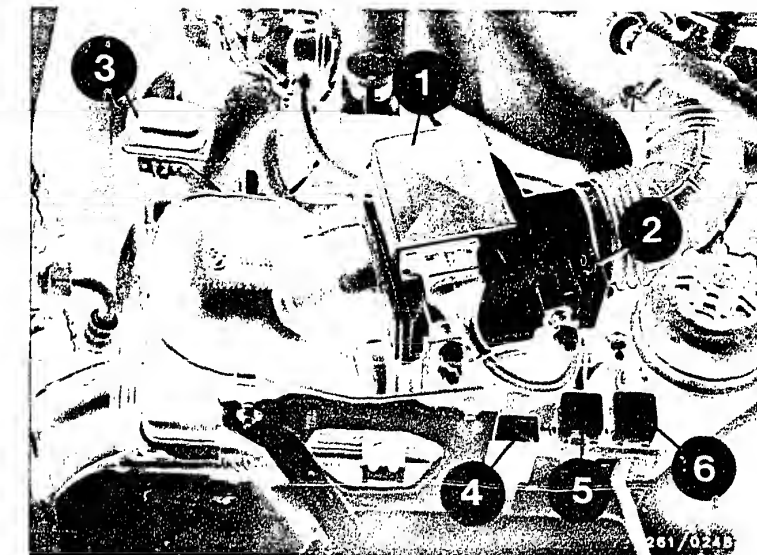
**C17**

Testing with universal test adapter  
BMW 325e (USA)





TEST STEP 1: Switch off ignition. Disconnect control unit and pump relay.		
Operation:	Reading	Testing
Program switch "V" in setting: 	Resistance must be greater than 1 M $\Omega$	Component: Rotational-speed sensor
Program-switch " $\Omega$ " in setting: 1		
Test equipment: Ohmmeter	<div>yes</div> <div>Continue testing with next test step.</div> <div>no</div>	Operation: Insulation from Term. 8 to ground
Scale: 10 M $\Omega$		
Connection: Test sockets		Malfunction: Resistance less than 1 M $\Omega$
Operation in vehicle: Switch off ignition		



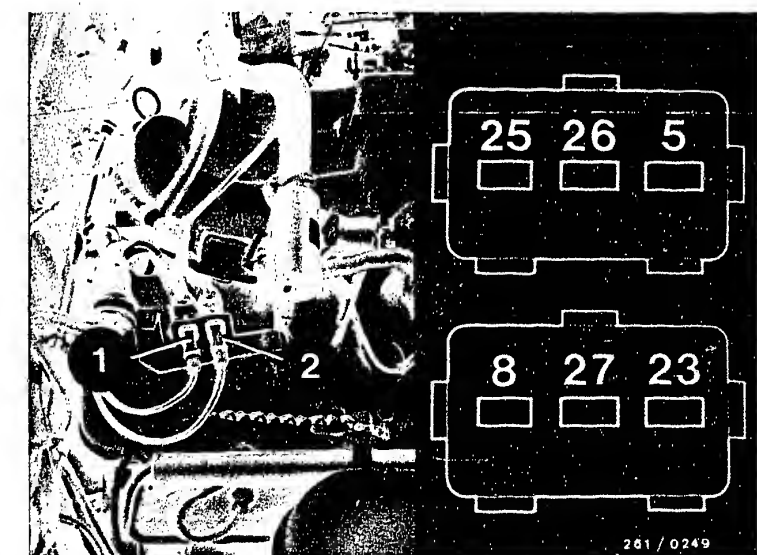
4 = Relay 2 (main relay)  
5 = Relay for sensor heater  
6 = Relay 1 (pump relay)

1 = Plug connection for reference mark sensor with gray plug  
2 = Plug connection for rotational-speed sensor with black plug

### Trouble-shooting:

Check plug connection for corrosion and damage to insulation. Take apart the plug connection and on the plug that leads to the test adapter, jump terminals 8 and 27 with a wire. Repeat the test: If the reading is now O.K., take out and replace the rotational-speed sensor. If the reading still is less than the specified value, the leads from the control unit plug Term. 8 or Term. 27 to the plug have damaged insulation (e.g., ground connection due to wear).

Continued on C20/C21



**C18**

Testing with universal test adapter  
BMW 325e (USA)



**C19**

Testing with universal test adapter  
BMW 325e (USA)



## Trouble-shooting, TEST STEP 1 (continued)

- Replace the sensor.

To take out and replace the sensors, unscrew the socket hex screw on the sensor. Remove dirt deposits on the sensor. If necessary, insert two screwdrivers into the recesses at the left and the right of the sensor and lift the sensor.

Before putting the sensor in, make certain that no metal parts cling to it. (The sensors contain permanent magnets.) Grease the sensors with Molykote Longterm 2.

Do not confuse the sensors one for the other on installation!

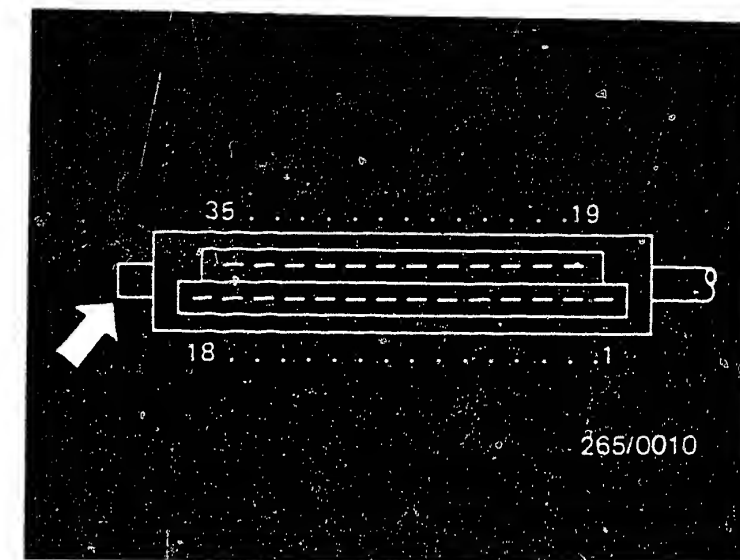
### Watch the identification marking:

The reference mark sensor is identified with a cable binder.

The sensors are inserted into the hole down to the stop, and screwed tight. Do not use any force when putting them in.

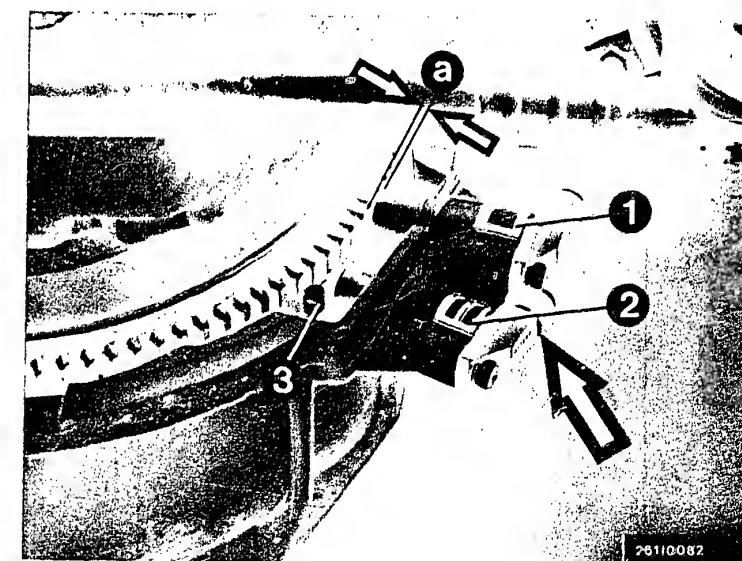
On assembly, make certain that the couplings are correctly assigned!

Make certain that there is a proper seating and latching of the spring contacts in the plug! It must not be possible to shove the spring contacts back!



Top view of the control unit plug (35-pole), with terminal numbers.  
Arrow = "lug" with mechanical coding.

- 1=Rotational-speed sensor (D)
- 2=Reference mark sensor (B)
- 3=Reference mark
- a=Air gap
- Arrow = Identification marking for reference mark sensor



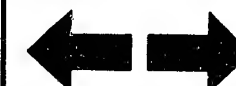
**C20**

Testing with universal test adapter  
BMW 325e (USA)




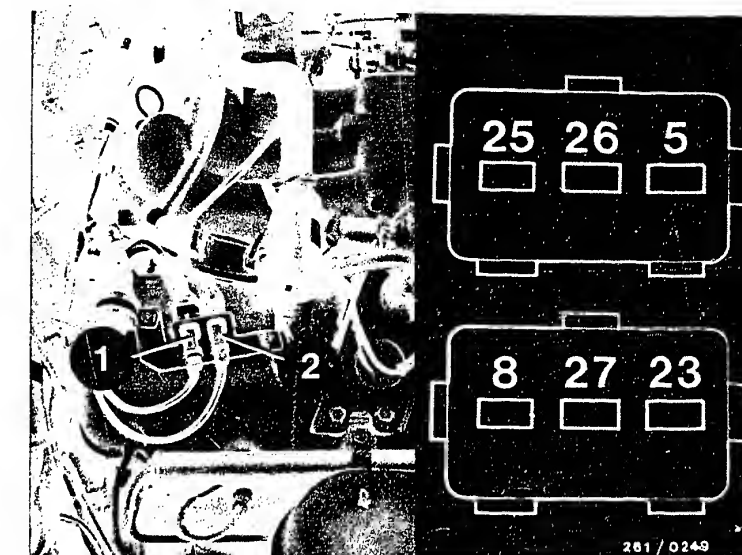
**C21**

Testing with universal test adapter  
BMW 325e (USA)





TEST STEP 2:		
Operation	Reading	Testing
Program switch "V" in setting: 	Resistance must be greater than 1 M $\Omega$	Component: Reference mark sensor
Program switch " $\Omega$ " in setting: 2		
Test equipment: Ohmmeter	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> yes ↓ Continue test- ing with next test step. </div> <div style="text-align: center;"> no ↓ </div> </div>	Operation: Insulation from Term. 25 to ground
Scale: 10 M $\Omega$		Malfunction: Resistance less than 1 M $\Omega$
Connection: Test sockets $\Omega$		
Operation in vehicle: Switch off ignition.		



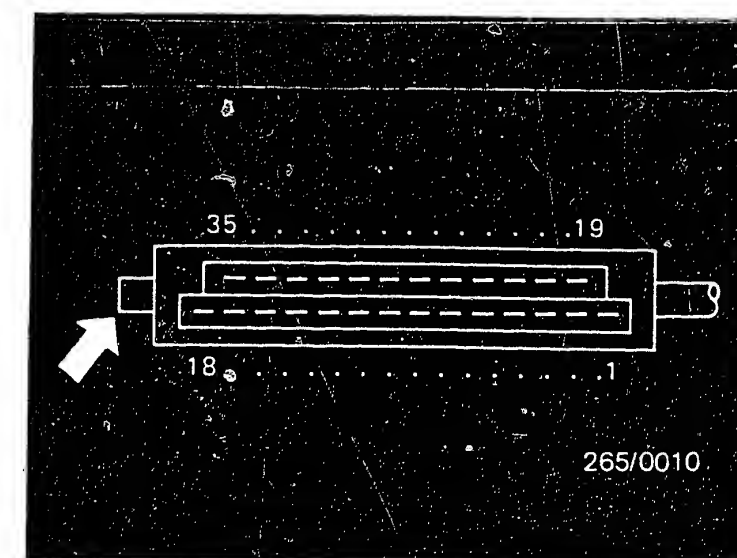
- 1 = Plug connection for reference mark sensor, with gray plug  
2 = Plug connection for rotational-speed sensor, with black plug

Top view of control unit plug (35-pole) with terminal numbers.  
Arrow = "Lug" with mechanical coding

### Trouble-shooting:

Check plug connection for corrosion and damage to insulation. Take apart the connection and on the plug that leads to the test adapter, jump terminals 25 and 26 with a wire. Repeat the test: If the reading is now O.K., take out and replace the rotational-speed sensor. If the reading is still less than the specified value, the leads from the control unit plug Term. 25 or Term. 26 to the plug have damaged insulation (e.g., ground short due to wear).

Continued on D1/D2.



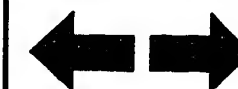
**C22**

Testing with universal test adapter  
BMW 325e (USA)



**C23**

Testing with universal test adapter  
BMW 325e (USA)



## Trouble-shooting TEST STEP 2 (continued)

- Replace the sensor.

To take out and replace the sensor, unscrew the socket hex screw on the sensor. Remove dirt deposits on the sensor. If necessary, insert two screwdrivers into the recesses at the left and the right of the sensor and lift the sensor.

Before putting the sensor in, make certain that no metal parts cling to it. (The sensors contain permanent magnets.) Grease the sensors with Molykote Longterm 2.

Do not confuse the sensors one for the other on installation!

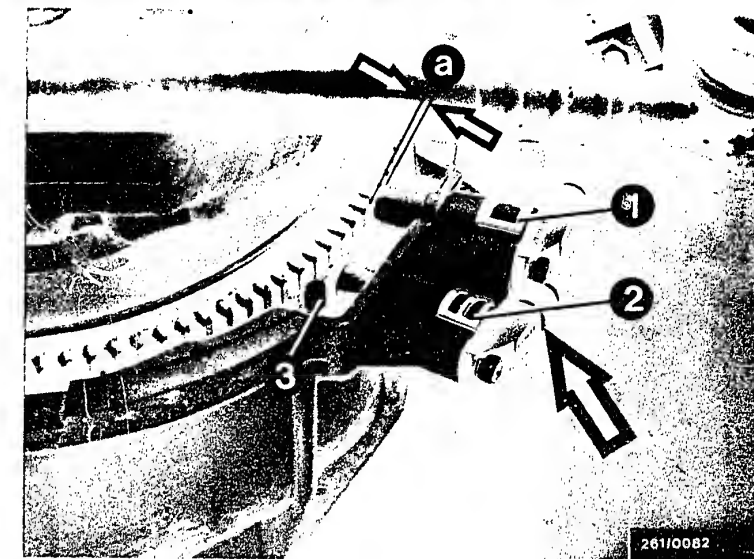
### Watch the identification marking:

The reference mark sensor is identified with a cable binder.

The sensors are inserted into the hole down to the stop, and screwed tight. Do not use any force when putting them in.

On assembly, make certain that the couplings are correctly assigned!

Make certain that there is a proper seating and latching of the spring contacts in the plug! It must not be possible to shove the spring contacts back!



1 = Rotational-speed sensor (D)

2 = Reference mark sensor (B)

3 = Reference mark

a = air gap

Arrow = Identification marking for reference mark sensor

**D1**

Testing with universal test adapter  
BMW 325e (USA)

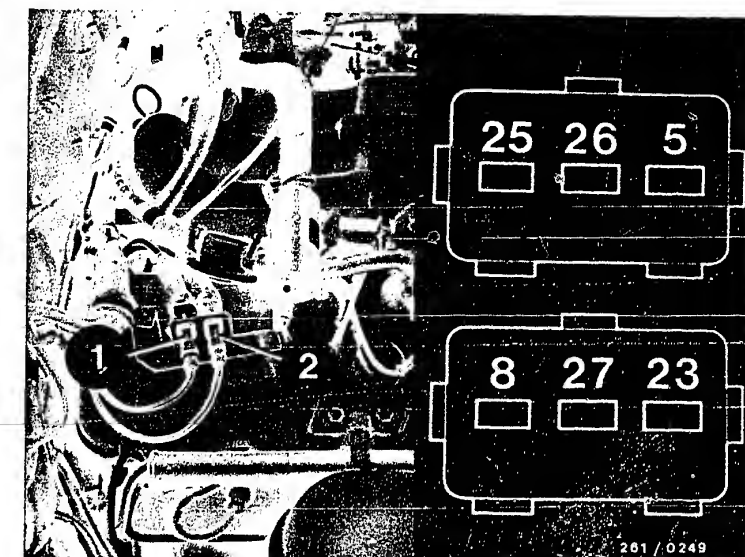


**D2**

Testing with universal test adapter  
BMW 325e (USA)

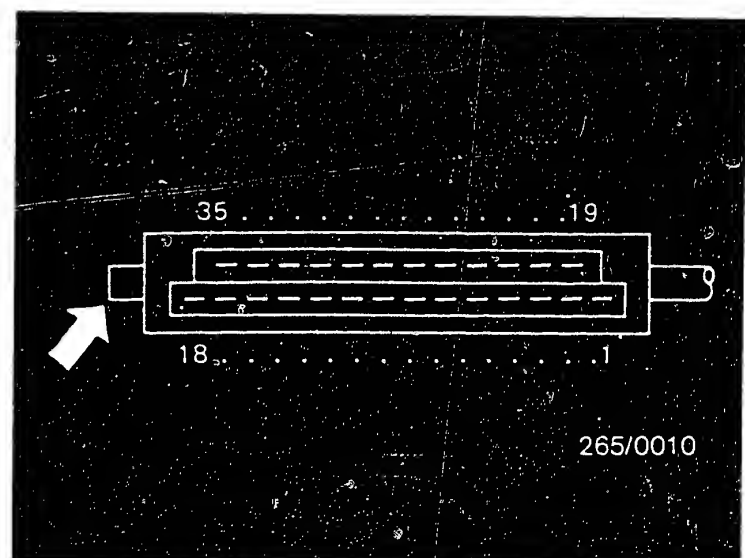


TEST STEP 3:		
Operation	Reading	Testing
Program switch "V" in setting:	↓ Ohmmeter must read 0.6 ... 1.6 kΩ	Component: Rotational-speed sensor
Program switch "Ω" in setting:	3	
Test equipment: Ohmmeter	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">             yes ↓ Continue testing with next test step.           </div> <div style="text-align: center;">             no ↓           </div> </div>	Operation: Coil resistance between Term. 8 and Term. 27
Scale: 0 to 10 kΩ		Malfunction: Resistance not within tolerance
Connection: Test sockets		
Operation in vehicle: Switch off ignition		



- 1 = Plug connection for reference mark sensor, with gray plug  
2 = Plug connection for rotational speed sensor, with black plug

Top view of control unit plug (35-pole), with terminal numbers.  
Arrow = "Lug" with mechanical coding.



#### Trouble-shooting:

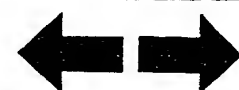
- Repeat the measurement directly on the sensor plug.
- Check the plug connection: Corrosion, loose contact, (it must not be possible to shove the spring contacts back!)
- Check the leads from the rotational-speed sensor Term. 8 and Term. 27 to the control unit plug Term. 8 and Term. 27.
- Take out and replace the sensor.

To take out and replace the sensor, unscrew the socket hex screw on the sensor. Remove dirt deposits on the sensor. If necessary, insert two screwdrivers into the recesses at the left and the right of the sensor and lift the sensor.

Continued on D5/D6

**D3**

Testing with universal test adapter  
BMW 325e (USA)



**D4**

Testing with universal test adapter  
BMW 325e (USA)



### Trouble-shooting TEST STEP 3 (continued)

Before putting the sensor in, make certain that no metal parts cling to it. (The sensors contain permanent magnets.) Grease the sensors with Molykote Longterm 2.

Do not confuse the sensors one for the other on installation!

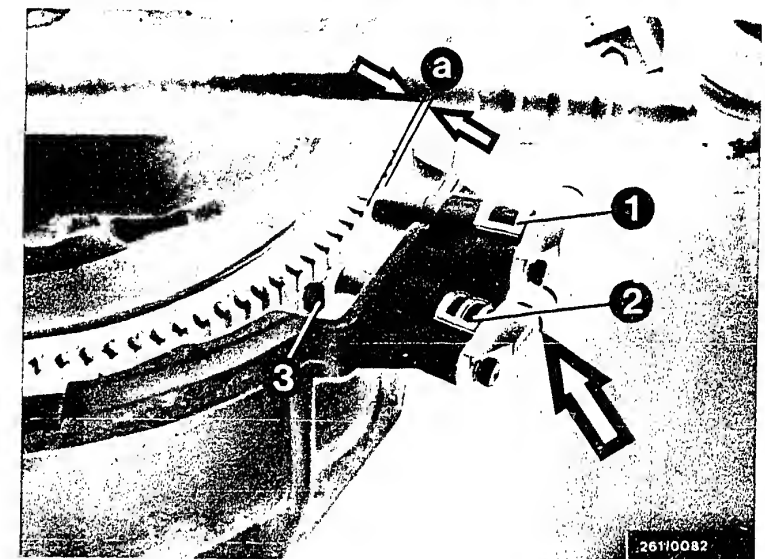
Watch the identification marking:

The reference mark sensor is identified with a cable binder.

The sensors are inserted into the hole down to the stop, and screwed tight. Do not use any force when putting them in.

On assembly, make certain that the couplings are correctly assigned!

Make certain that there is a proper seating and latching of the spring contacts in the plug! It must not be possible to shove the spring contacts back!



- 1 = Rotational-speed sensor (D)
- 2 = Reference mark sensor (B)
- 3 = Reference mark
- a = Air gap
- Arrow = Identification marking for reference mark sensor

**D5**

Testing with universal test adapter  
BMW 325e (USA)



**D6**

Testing with universal test adapter  
BMW 325e (USA)



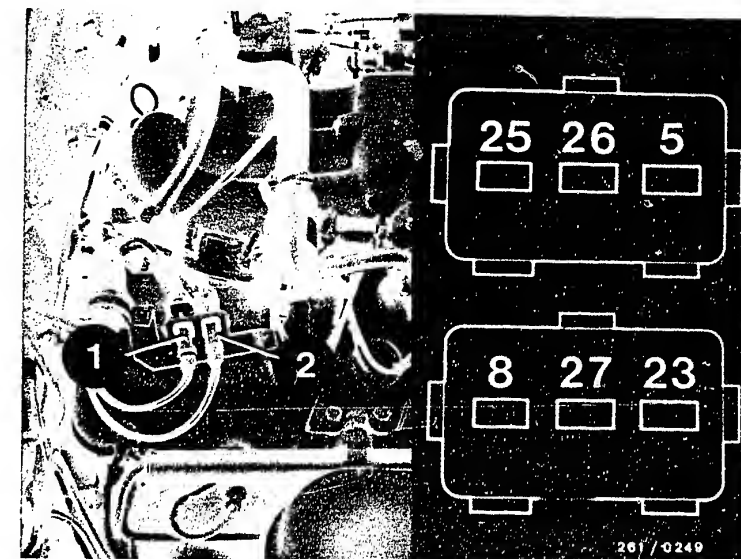
TEST STEP 4:			
Operation		Reading	Testing
Program switch "V" in setting:	↓	Ohmmeter must read 0.6 ... 1.6 kΩ	Component: Reference mark sensor
Program switch "Ω" in setting:	4		
Test equipment: Ohmmeter		<div> <div>yes</div> <div>↓</div> <div>Continue testing with next test step.</div> </div> <div>no</div>	Operation: Coil resistance between Term. 25 and Term. 26  Malfunction: Resistance not within tolerance
Scale: 0 to 10 kΩ			
Connection: Test sockets	Ω		
Operation in vehicle: Switch off ignition.			

#### Trouble-shooting:

- Repeat the measurement directly on the sensor plug.
- Check the plug connection: Corrosion, loose contact, (it must not be possible to shove the spring contacts back!)
- Check the leads from the reference-speed sensor Term. 25 and Term. 26 to the control unit plug Term. 25 and Term. 26.
- Take out and replace the sensor.

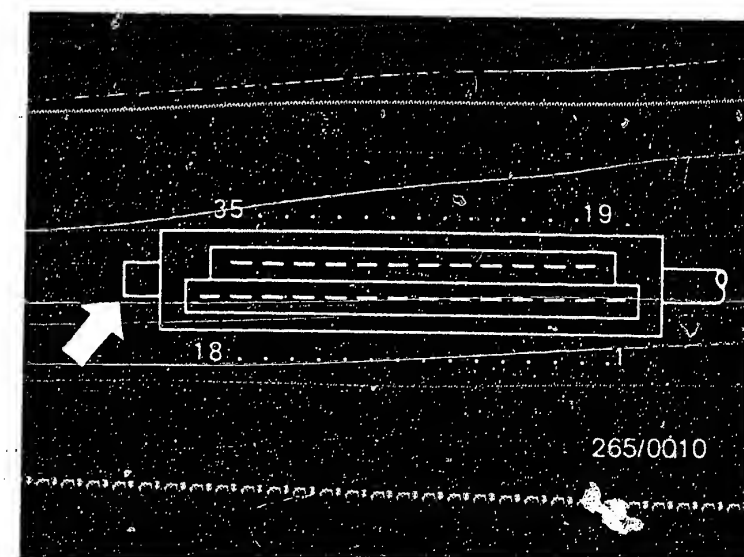
To take out and replace the sensor, unscrew the socket hex screw on the sensor. Remove dirt deposits on the sensor. If necessary, insert two screwdrivers into the recesses at the left and the right of the sensor and lift the sensor.

Continued on D9/D10



- 1 = Plug connection for reference mark sensor, with gray plug
- 2 = Plug connection for rotational speed sensor, with black plug

Top view of control unit plug (35-pole), with terminal numbers.  
Arrow = "Lug" with mechanical coding.



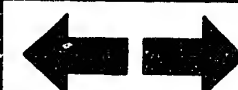
**D7**

Testing with universal test adapter  
BMW 325e (USA)



**D8**

Testing with universal test adapter  
BMW 325e (USA)





#### Trouble-shooting TEST STEP 4 (continued)

Before putting the sensor, make certain that no metal parts cling to it. (The sensors contain permanent magnets.) Grease the sensors with Molykote Longterm.

Do not confuse the sensors one for the other on installation!

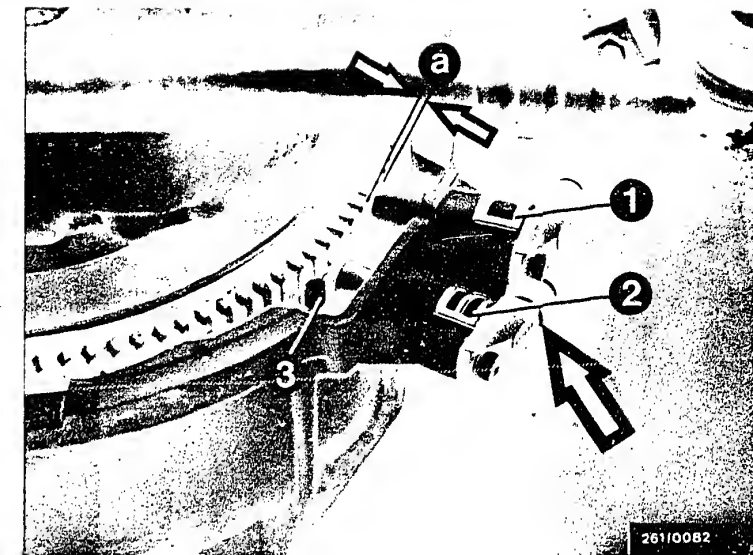
#### Watch the identification marking:

The reference mark sensor is identified with a cable binder.

The sensors are inserted into the hole down to the stop, and screwed tight. Do not use any force when putting them in.

On assembly, make certain that the couplings are correctly assigned!

Make certain that there is a proper seating and latching of the spring contacts in the plug! It must not be possible to shove the spring contacts back!



- 1 = Rotational-speed sensor (D)
- 2 = Reference mark sensor (B)
- 3 = Reference mark
- a = Air gap
- Arrow = Identification marking for reference mark sensor

**D9**


Testing with universal test adapter  
BMW 325e (USA)

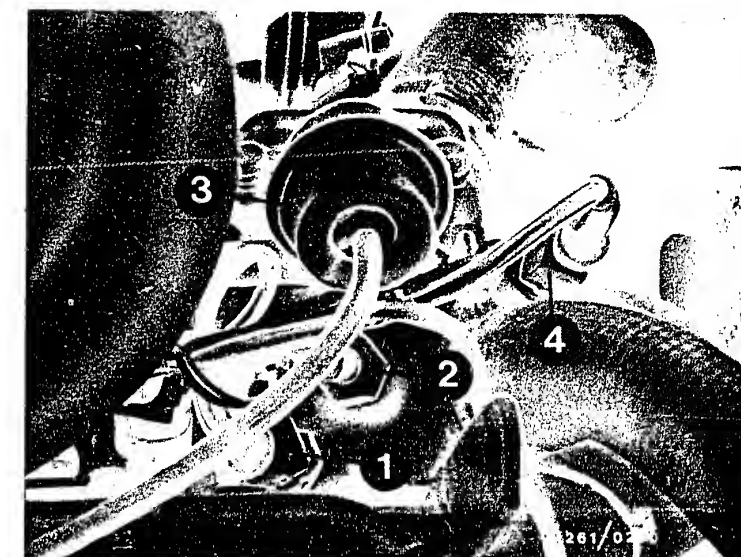


**D10**

Testing with universal test adapter  
BMW 325e (USA)



TEST STEP 5:			
Operation		Reading	Testing
<u>Program switch "V"</u> <u>in setting:</u>		Measurement depends on temperature, i.e., watch the engine temperature. At ambient temperature (+15°C...+30°C): <u>1.3...3.6 kΩ</u>  With engine at normal operating temperature (approx. +80°C): <u>250...390 Ω</u>	<u>Component:</u> Temperature sensor engine (NTC II)
<u>Program switch "Ω"</u> <u>in setting:</u>	5		
<u>Test equipment:</u> Ohmmeter			
<u>Scale:</u> 0 to 10 kΩ		<div><div>yes</div><div>↓</div><div>Continue testing with <u>next test step</u>.</div></div> <div><div>no</div><div>↓</div></div>	<u>Operation:</u> Resistance between Term. 13 and ground
<u>Connection:</u> Test sockets	Ω		
<u>Operation in vehicle:</u> Switch off ignition			
			<u>Malfunction:</u> Resistance not within tolerance. Watch the temperature!



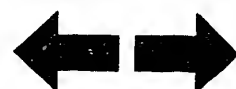
- 1 = Temperature sensor, engine (NTC II)
- 2 = Remote thermometer sensor
- 3 = Pressure regulator
- 4 = Thermotime switch

#### Trouble-shooting:

- Disconnect the plug on the temperature sensor and measure the resistance directly. If need be, take out and replace the temperature sensor.
- Check the leads from the temperature sensor to the control unit plug Term. 13 and to the ground terminal.
- Eliminate contact resistances in the plug connections. It must not be possible to shove the spring contacts back!

**D11**

Testing with universal test adapter  
BMW 325e (USA)



**D12**

Testing with universal test adapter  
BMW 325e (USA)

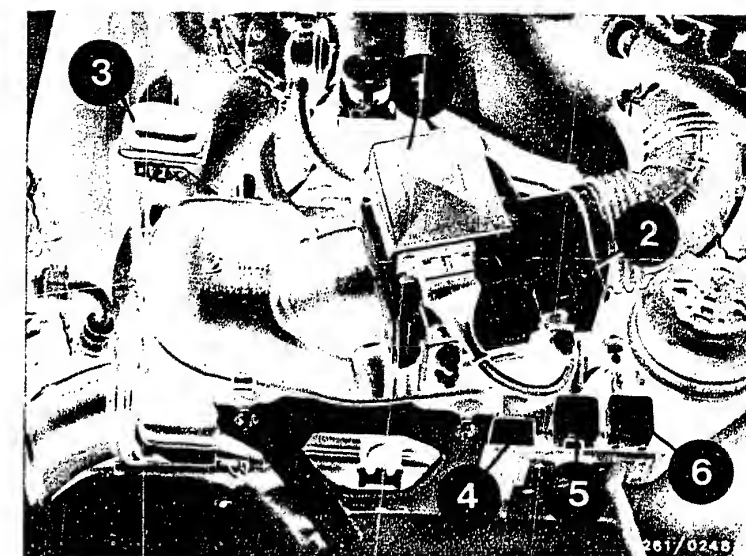




TEST STEP 6:		
Operation		Reading
Program switch "V" in setting:	↓	Measurement depends on temperature, i.e., watch air temperature in the intake channel. At ambient temperature (+15°C...+30°C) 1.45 ... 3.3 kΩ
Program switch "Ω" in setting:	6	
Test equipment: Ohmmeter		With engine at normal operating temperature (approx. +80°C): 280 ... 360 Ω
Scale: 0 to 10 kΩ		
Connection: Test sockets	Ω	yes ↓ Continue testing with next test step.
Operation in vehicle: Switch off ignition		no ↓
		Malfunction: Resistance not within tolerance. Watch the temperature!

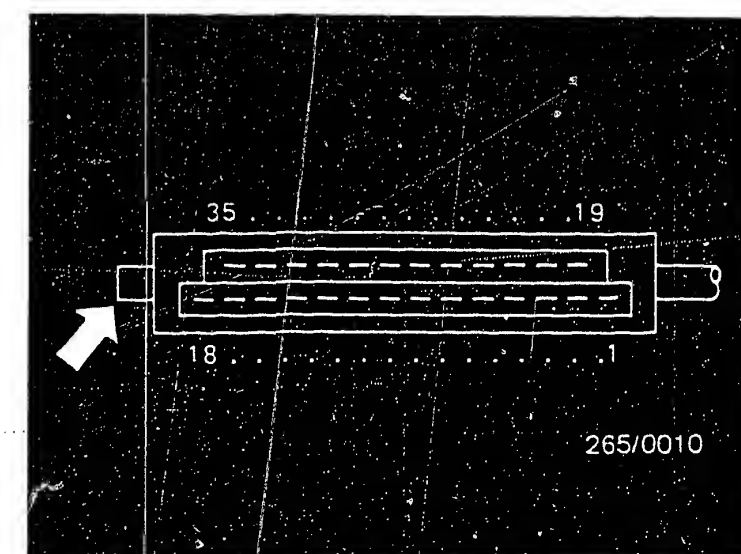
#### Trouble-shooting:

- Disconnect plug at the air-flow sensor and measure resistance directly at Term. 22 and Term. 6.  
If the measurement is not within tolerance, take out and replace the air-flow sensor.
- Leads from the air-flow sensor Term. 6 and Term. 22 to the control unit plug Term. 6 and Term. 22.
- Eliminate contact resistances in the plug connections.  
It must not be possible to shove the spring contacts back!



1 = Air-flow sensor with NTC I  
2 = Idle-mixture-adjusting screw

Top view of control unit plug (35-pole), with terminal numbers.  
Arrow = "Lug" with mechanical coding.



**D 13**

Testing with universal test adapter  
BMW 325e (USA)



**D 14**

Testing with universal test adapter  
BMW 325e (USA)



**TEST STEP 7:**

Operation

Reading

Testing

Program switch "V"  
in setting:



less than 10  $\Omega$

Component:

Lead for map switch

Program switch " $\Omega$ "  
in setting:

7

Test equipment:  
Ohmmeter

yes

no

Scale:  
0 to 10 k $\Omega$

Continue testing  
with test step  
9.  
(Test step 8 is  
not used)

Operation:

Connection between Term. 10  
and ground

Malfunction:

Resistance greater than 10  $\Omega$

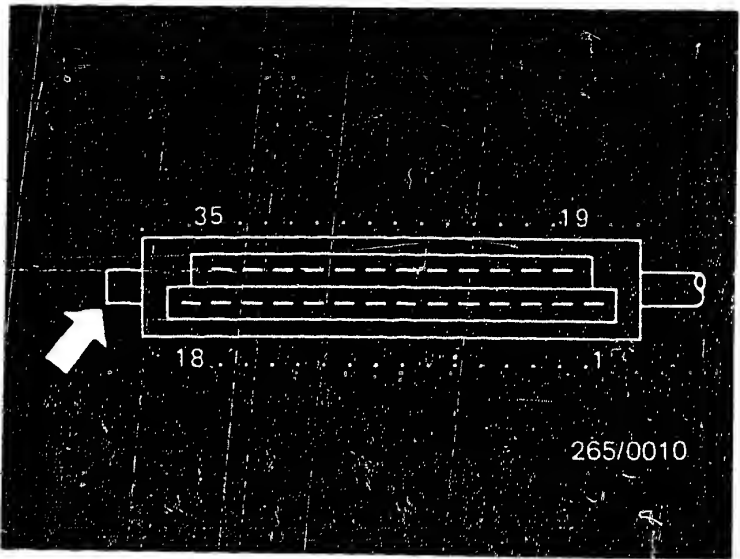
Connection:  
Test sockets

$\Omega$

Operation in vehicle:  
Switch ignition off

Trouble-shooting:

- Make connection from the multiple plug Term. 10 to ground.



Top view of control unit plug (35-pole), with terminal numbers.  
Arrow = "Lug" with mechanical coding.

**D15**

Testing with universal test adapter  
BMW 325e (USA)

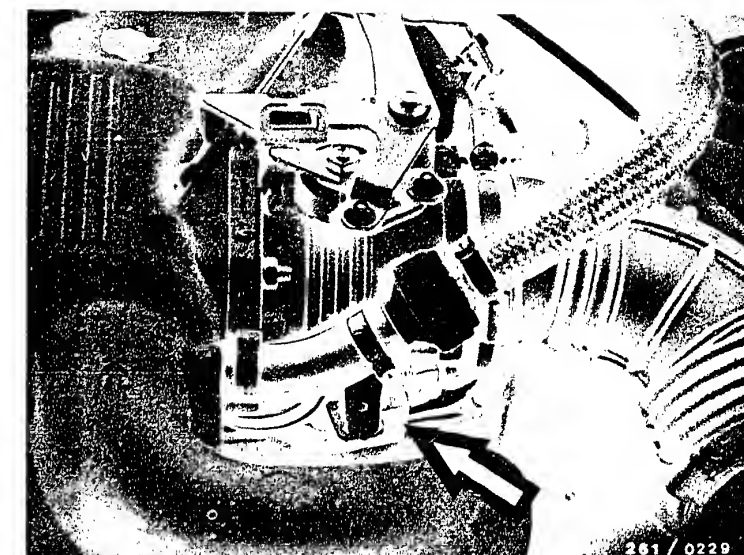


**D16**

Testing with universal test adapter  
BMW 325e (USA)



<b>TEST STEP 9:</b> (Test step 8 is not used)		
<u>Operation:</u>		<u>Reading:</u>
Program switch "V" in setting:	↓	Accelerator pedal in at rest position: less than 10 Ω
Program switch "Ω" in setting:	9	(Measurement is affected by the resistor in the adapter.)
<u>Test equipment:</u> Ohmmeter		<u>Step down on the accelerator.</u> (Part load range): ∞Ω 1)
<u>Scale:</u> 0 to 10 kΩ		
<u>Connection:</u> Test sockets	Ω	yes ↓ Continue testing with next test step.
<u>Operation in vehicle:</u> Switch ignition off		no ↓
		<u>Testing:</u>
		<u>Component:</u> Throttle valve switch
		<u>Operation:</u> Idle contact between Terminal 2 and ground
		<u>Malfunction:</u> Resistance in at rest position greater than 10 Ω or less than ∞Ω.



Arrow = Throttle valve switch

# Trouble-shooting:

## 1) Adjusting the throttle valve switch:

Undo the fastening screws. Turn the control lever to full throttle and slowly move it back to the idle stop. Continue turning the switch in a clockwise direction until the contact switches perceptibly (reading less than 10 Ω). Tighten screws.

Continued on D19/D20

**D 17**

Testing with universal test adapter  
BMW 325e (USA)



**D 18**

Testing with universal test adapter  
BMW 325e (USA)



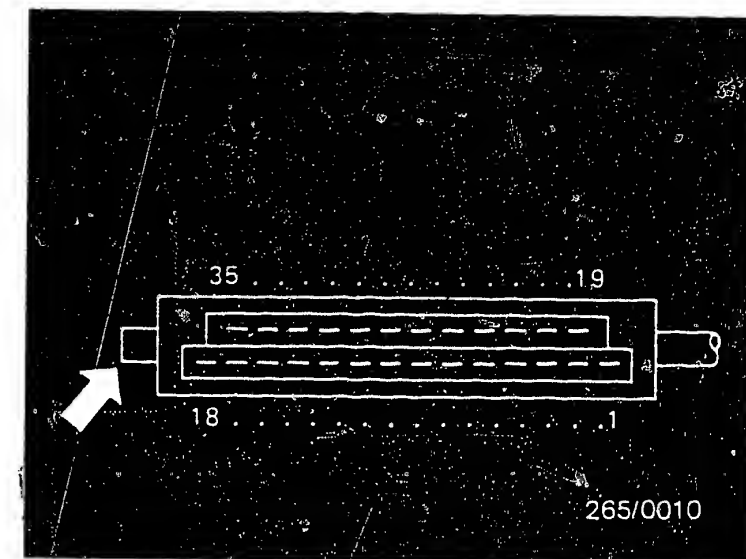
### Trouble-shooting, throttle valve switch (continued)

Checking: Slowly open the accelerator pedal in the direction of full load. After being moved a short distance, the reading must shift to  $\infty$ .

If no adjustment is possible:

Check the throttle valve switch (idle contact) and the leads from the throttle valve switch to the control unit plug Term. 2 and to the ground terminal.  
Eliminate contact resistances.

It must not be possible to shove spring contacts back!



Top view of control unit plug (35-pole), with terminal numbers.  
Arrow = "Lug" with mechanical coding.



TEST STEP 10		
Operation	Reading	Testing
Program switch "V" in position	↓	Component: Throttle valve switch
Program switch "Ω" in position	10	
Test equipment: Ohmmeter	∞Ω Acceleration pedal at full-load stop less than 10 Ω 1)	Operation: Full-load contact between Terminal 3 and ground
Scale 0 to 10 kΩ	(Measurement is affected by the resistor in the adapter)	
Connection: Test sockets	Ω	Malfunction: Resistance at full load greater than 10 Ω or ∞Ω.
Operation in vehicle: Switch off ignition	yes ↓ Continue testing with next test step.	
	no ↓	

#### Trouble-shooting:

- 1) Checking: Move the throttle valve in the direction of full load. Shortly before the full-load stop for the control lever, the reading shifts to values less than 10 Ω. (Full-load contact closed).

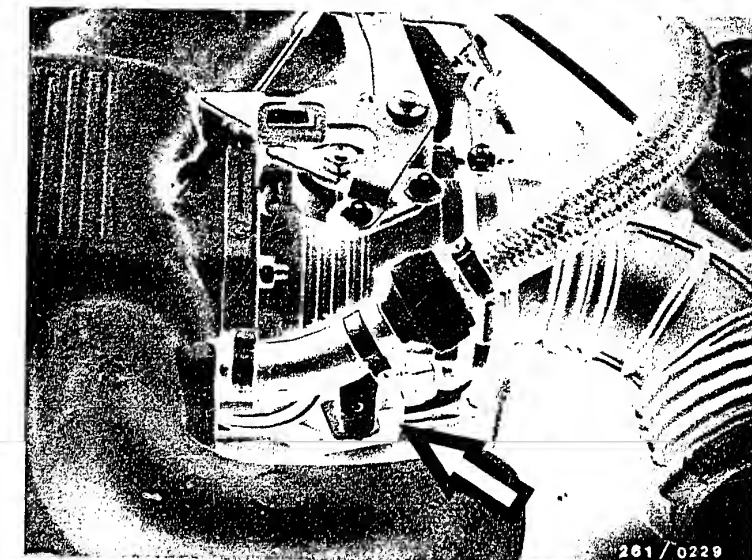
Reading greater than 10 Ω or ∞Ω:

Check whether the throttle valve opens completely. Check the bowden cable from the accelerator pedal to the throttle valve.

Check the throttle-valve switch and the lead from the throttle-valve switch Term. 3 to the control unit plug Term. 3.

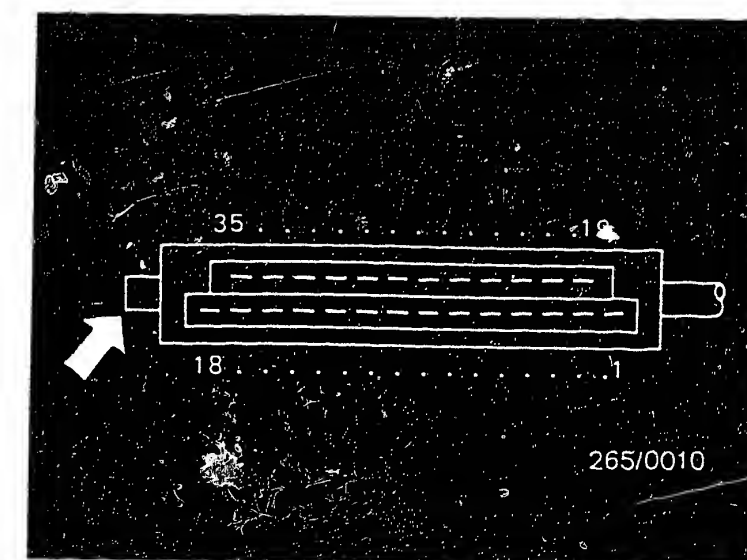
Eliminate contact resistances.

It must not be possible to shove spring contacts back!



Arrow = Throttle valve switch

Top view of control unit plug (35-pole) with terminal numbers.  
Arrow = "Lug" with mechanical coding.



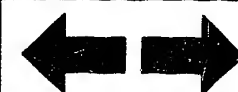
**D21**

Testing with universal test adapter  
BMW 325e (USA)




**D22**

Testing with universal test adapter  
BMW 325e (USA)





TEST STEP 11			
Operation		Reading	Testing
<u>Program switch "V"</u> in setting:		Ohmmeter must read <u>less than 10 Ω</u>	<u>Component:</u> Ground lead
<u>Program switch "Ω"</u> in setting:	11	(Measurement is affected by the resistor in the adaptor)	
<u>Test equipment</u> Ohmmeter		<u>Operation:</u> Contact resistance between Term. 16 and ground	
<u>Scale:</u> 0 to 10 kΩ			
<u>Connection:</u> Test sockets	Ω	<u>Malfunction:</u> Resistance greater than 10 Ω	
<u>Operation in vehicle:</u> Switch off ignition			

#### Trouble-shooting:

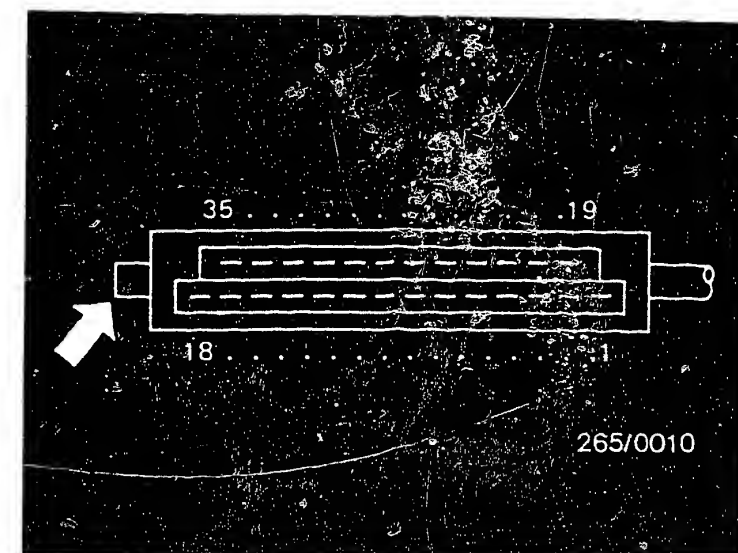
To test, disconnect the wiring harness plug from the test adapter and, if necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter (specified value approx. 0  $\Omega$ ):

- From the control unit plug Term. 16 to the ground terminal.
- From the control unit plug Term. 5 to the ground terminal.

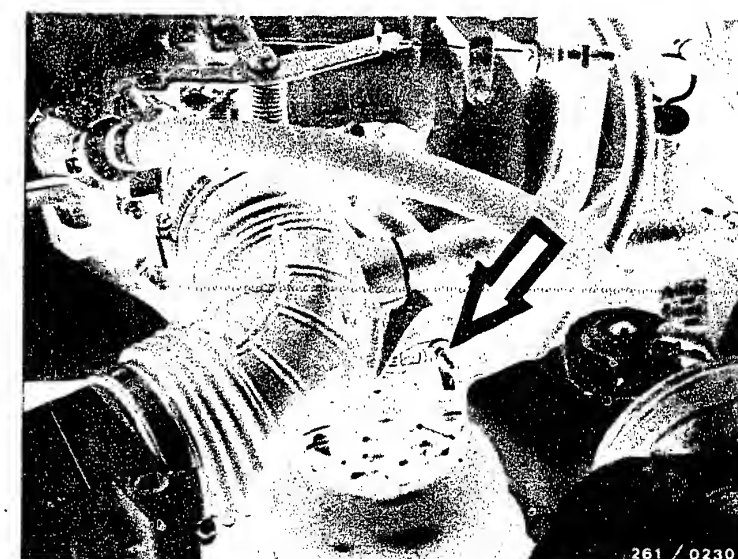
Eliminate contact resistances at the connections.

It must not be possible to shove spring contacts back!



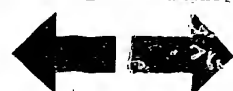
Top view of control unit plug (35-pole), with terminal numbers.  
Arrow = "Lug", with mechanical coding

Arrow = Motronic ground terminal



**D23**

Testing with universal test adapter  
BMW 325e (USA)

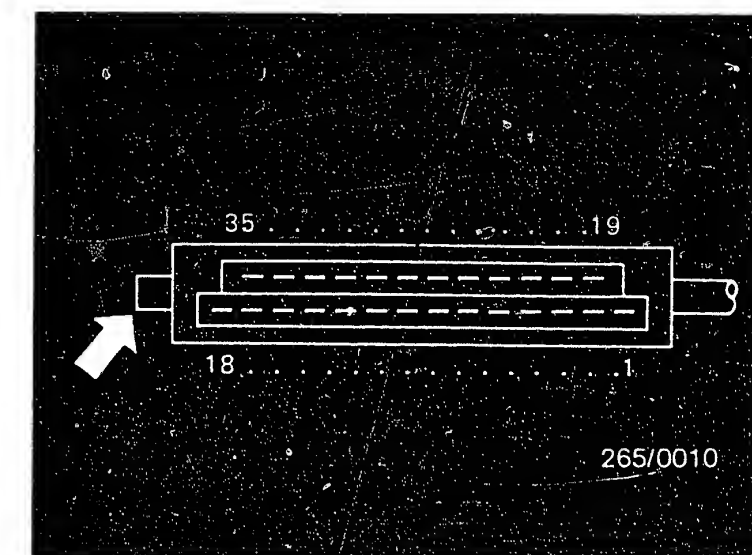


**D24**

Testing with universal test adapter  
BMW 325e (USA)

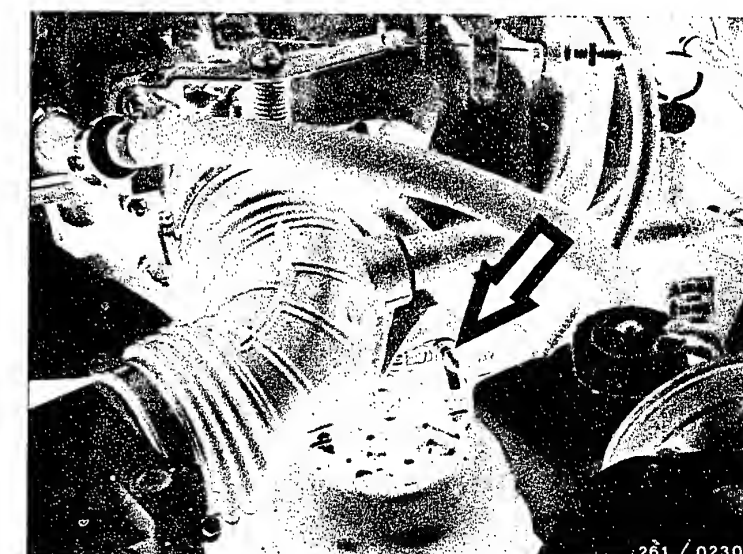


TEST STEP 12			
Operation		Reading	Testing
Program switch "V" in setting:	↓	Ohmmeter must read less than 10 $\Omega$ .	Component: Ground Lead
Program switch " $\Omega$ " in setting:	12	(Measurement is affected by the resistor in the adapter.)	
Test equipment: Ohmmeter		<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">             yes ↓ Continue test- ing with next test step           </div> <div style="text-align: center;">             no ↓           </div> </div>	Operation: Contact resistance between Term. 17 and ground
Scale: 0 to 10 k $\Omega$			
Connection: Test sockets	$\Omega$		Malfunction: Resistance greater than 10 $\Omega$
Operation in vehicle: Switch off ignition			



Top view of control unit plug (35-pole), with terminal numbers.  
Arrow = "Lug", with mechanical coding

Arrow = Motronic ground terminal



### Trouble-shooting:

To test, disconnect the wiring harness plug from the test adapter and, if necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter (specified value approx. 0  $\Omega$ ):

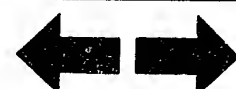
- From the control unit plug Term. 17 to the ground terminal.
- From the control unit plug Term. 5 to the ground terminal.

Eliminate contact resistances at the connections.

It must not be possible to shove spring contacts back!

**E1**

Testing with universal test adapter  
BMW 325e (USA)




**E2**

Testing with universal test adapter  
BMW 325e (USA)





TEST STEP 13:			
Operation		Reading	Testing
<u>Program switch "V"</u> in position:		Ohmmeter must read <u>less than 10 Ω</u>	<u>Component:</u> Ground lead
<u>Program switch "Ω"</u> in position:	13	(Measurement is affected by the resistor in the adapter)	
<u>Test equipment:</u> Ohmmeter		<div>yes</div> <div>no</div>	<u>Operation:</u> Contact resistance between Term. 19 and ground
<u>Scale:</u> 0 to 10 kΩ			
<u>Connection:</u> Test sockets	Ω		<u>Malfunction:</u> Resistance greater than 10 Ω
<u>Operation in vehicle:</u> Switch off ignition			

#### Trouble-shooting:

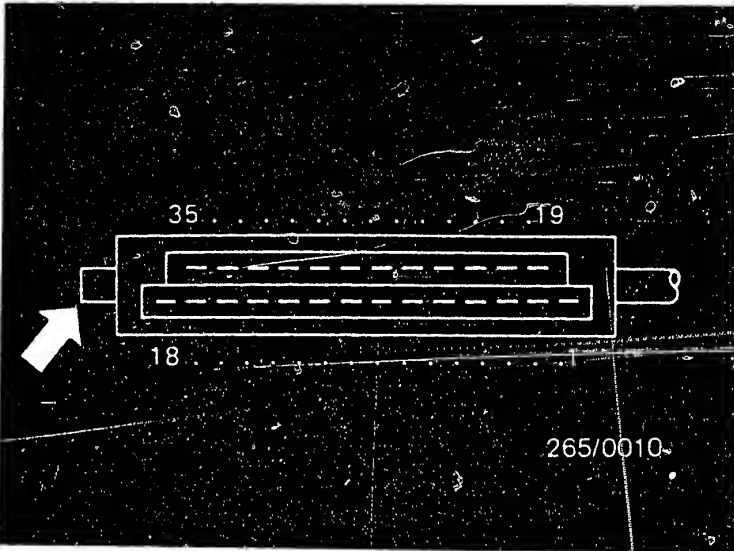
To test, disconnect the wiring harness plug from the test adapter and, if necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter (specified value approx. 0  $\Omega$ ):

- From the control unit plug Term. 19 to the ground terminal.
- From the control unit plug Term. 5 to the ground terminal.

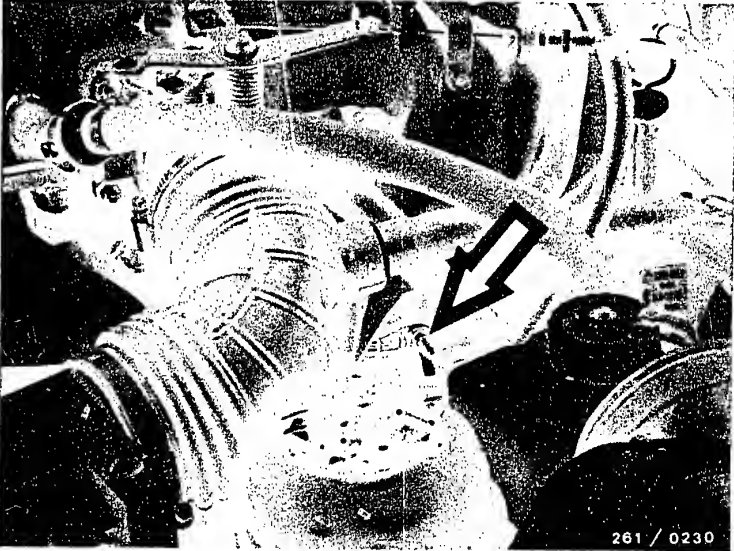
Eliminate contact resistances at the connections.

It must not be possible to shove spring contacts back!



Top view of control unit plug (35-pole), with terminal numbers.  
Arrow = "Lug", with mechanical coding

Arrow = Motronic ground terminal



TEST STEP 14:			
Operation:	Reading	Testing	
<div>Program switch "V" in setting:</div>	<div>↓</div>	<div>Component:</div> <div>Altitude sensor (pressure sensor)</div>	
<div>Program switch "Ω" in setting:</div>	<div>14</div>		
<div>Test equipment:</div> <div>Ohmmeter</div>	<div>(Measurement is affected by the altitude. The dependence on altitude is taken into consideration in test step 15.)</div> <div>-----</div> <div>yes</div> <div>↓</div> <div>Continue testing with <u>next test step</u></div>	<div>Operation:</div> <div>Resistance between Term. 30 and ground</div>	
<div>Scale:</div> <div>0 to 10 kΩ</div>		<div>no</div> <div>↓</div>	
<div>Connection:</div> <div>Test sockets</div>		<div>Ω</div>	<div>Malfunction:</div> <div>Resistance not within tolerance</div>
<div>Operation in vehicle:</div> <div>Switch off ignition</div>			

#### Trouble-shooting:

To test, disconnect the wiring harness plug from the test adapter and, if necessary, use a wiring diagram.

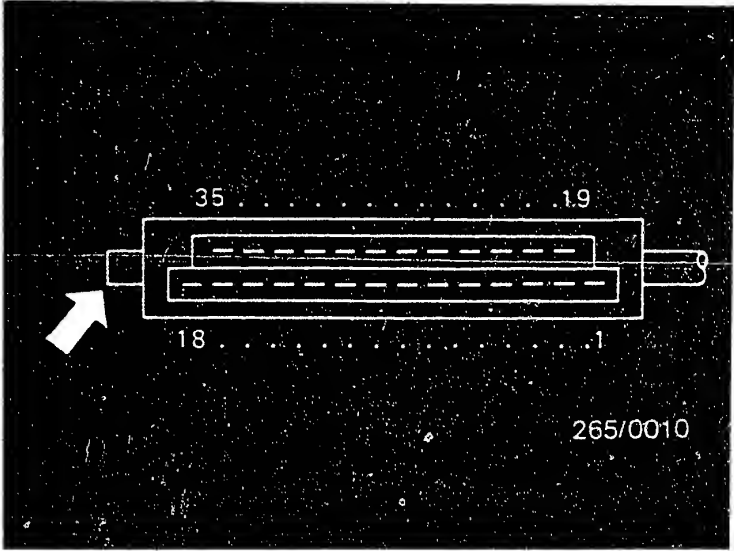
Check the following leads for continuity using an ohmmeter (specified value approx.  $0 \text{ }\Omega$ ):

- From the control unit plug Term. 30 to the altitude sensor.
- From the altitude sensor to the ground terminal.

Eliminate contact resistances at the connections.

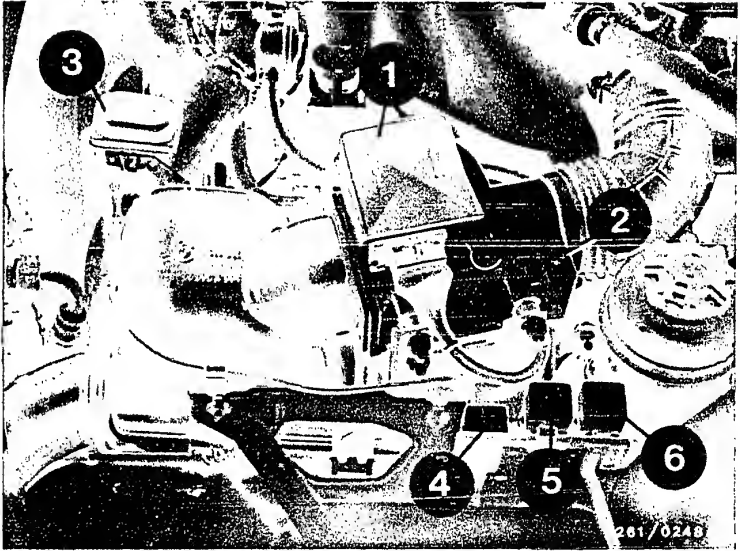
It must be possible to shove the spring contacts back!

Take out and replace the altitude sensor.



Top view of control unit plug (35-pole), with terminal numbers.  
Arrow = "Lug", with mechanical coding

3 = Altitude sensor



**TEST STEP 15:** N.B.! As an exception, voltage is measured at the  $\Omega$  sockets. Switch the measuring instrument over before switching the ignition on.

Operation		Reading	Testing
<u>Program switch "V"</u> <u>in setting:</u>	↓	Reading for voltage depends upon elevation and battery voltage. As the battery voltage and elevation increase, the wiper voltage at the altitude sensor increases.	<u>Component:</u> Altitude sensor (pressure sensor)
<u>Program switch "Ω"</u> <u>in setting:</u>	14		
<u>Test equipment:</u> Voltmeter		<u>Elevation above sea level:</u>  0 m: 1.5 ... 3.5 V 500 m: 2.5 ... 5 V 1000 m: 3.5 ... 6.0 V 1500 m: 4.5 ... 7.5 V  (V <sub>B</sub> between 10 V and 14 <sup>B</sup> V).	<u>Operation:</u> Wiper voltage measured on the pressure sensor between Term. 30 and ground.
<u>Scale:</u> 15 V			
<u>Connection:</u> Test sockets	Ω		
<u>Operation in vehicle:</u> Switch ignition on			
			<u>Malfunction:</u> No voltage, or voltage not within tolerance

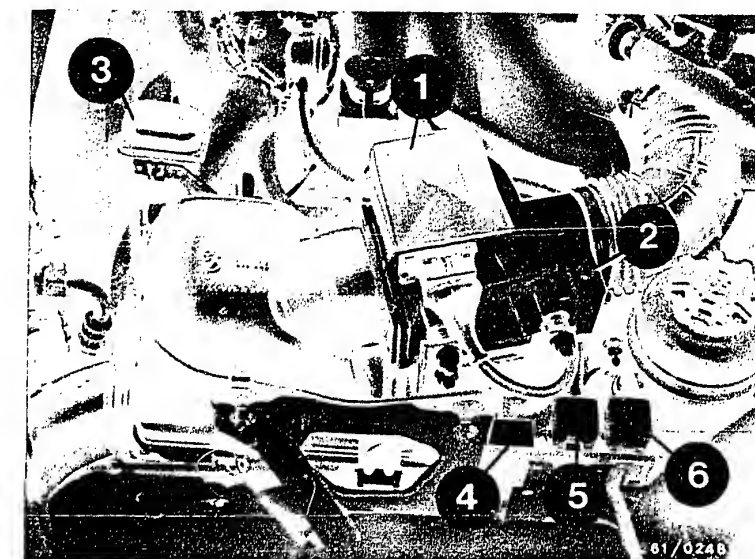
#### Trouble-shooting:

##### No voltage measurable:

With test step 20, find out if the main relay is O.K. If the main relay is O.K., check the lead from the main relay to the altitude sensor. If the lead and the plug connection are O.K., take out and replace the pressure sensor.

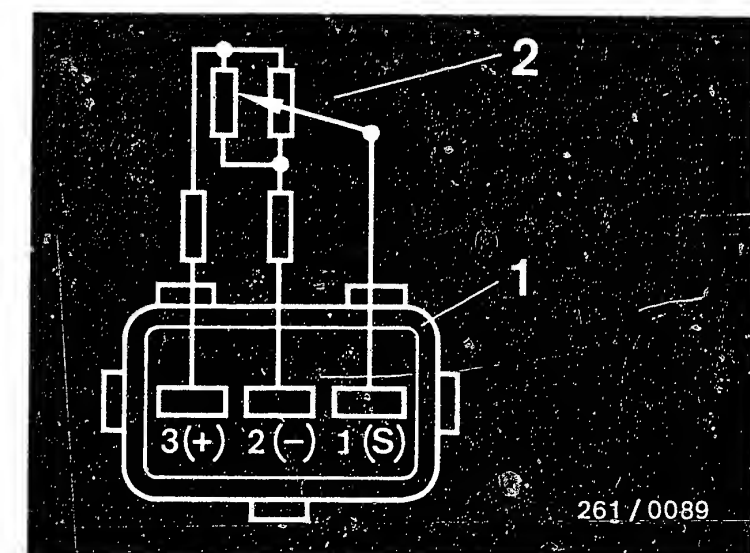
##### Voltage not within tolerance:

Watch the atmospheric pressure and battery voltage!  
Take out and replace the altitude sensor.



3 = Altitude sensor

1 = Top view of plug connection on the pressure sensor  
5 = Potentiometer wiper  
2 = Altitude sensor potentiometer



**E7**

Testing with universal test adapter  
BMW 325e (USA)

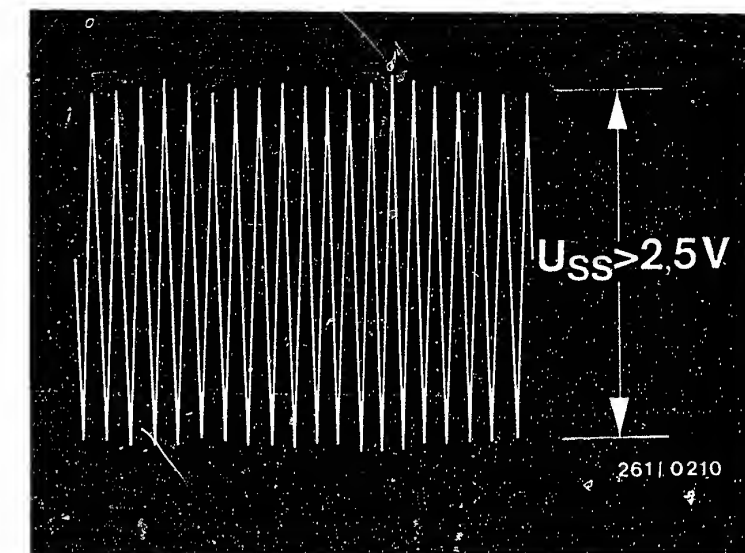


**E8**

Testing with universal test adapter  
BMW 325e (USA)

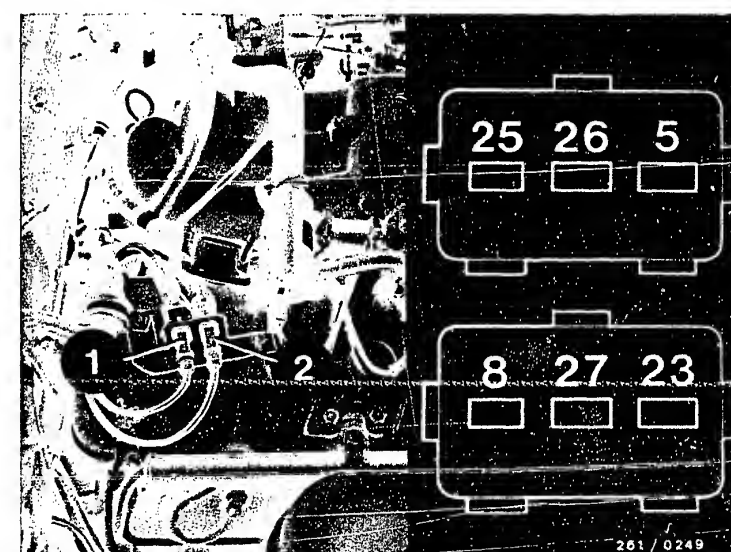


TEST STEP 16		
Operation	Reading	Testing
Program switch "V" in setting:	1	Component: Rotational-speed sensor
Program switch "S" in setting:	15	
Test equipment: Motortester, oscilloscope		Operation: Amplitude (signal) at Terminals 8 and 27
Scale: Special input		
Connection: Test wells. Red clip to red well, black clip to black well	yes ↓ Continue testing with next test step	Malfunction: No signal or too small a signal. Incorrect signal.
Operation in vehicle: Shift into neutral and start engine	no ↓	



Rotational-speed sensor signal

- 1 = Plug connection for reference mark sensor, with gray plug  
2 = Plug connection for rotational-speed sensor, with black plug



#### Trouble-shooting:

No signal, or too small a signal:

- Cranking speed less than  $200 \text{ min}^{-1}$ .  
Charge the battery.
- Check the nominal air gap  $a = 0.8 \text{ mm}$ :  
Remove the cover plate from the ring gear housing.

Continued on E11/E12

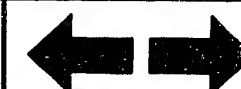
**E9**

Testing with universal test adapter  
BMW 325e (USA)



**E10**

Testing with universal test adapter  
BMW 325e (USA)



## Trouble-shooting TEST STEP 16 (continued)

- Taking out and replacing the rotational-speed sensor:  
Unscrew the socket hex screw on the sensor.  
Remove dirt deposits on the sensor. If necessary,  
insert two screwdrivers into the recesses at the left  
and right of the sensor and lift the sensor.
- Incorrect signal (severely extended, in the figure at  
the bottom):

Severely damaged tooth on the starting motor ring gear  
take out and replace the ring gear.

Before installing the sensors, make certain that no metal  
parts are clinging to the sensor. (The sensors contain  
permanent magnets.) Grease the sensors with Molykote  
Longterm 2.

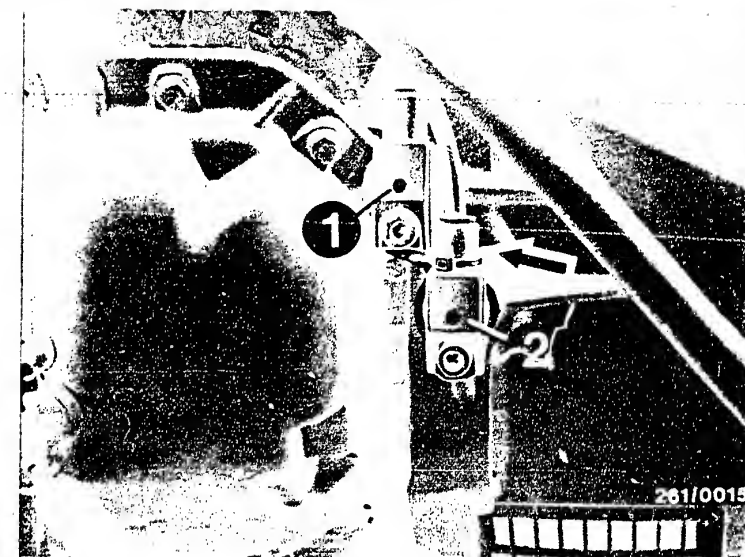
Do not confuse sensors one for the other on installation!

Watch the identification marking: Reference mark sensor  
with identification, and/or gray plug.  
Rotational-speed sensor without, black plug.

The sensors are inserted into the hole as far as the stop  
and screwed tight. Do not use any force when putting  
them in.

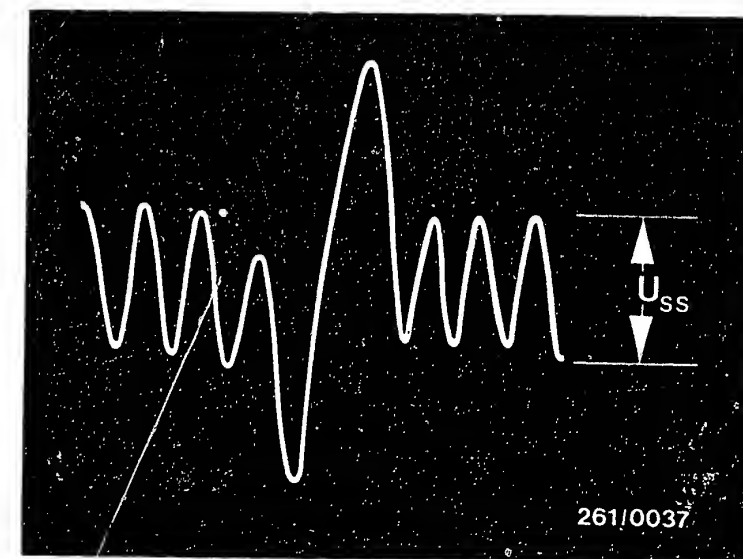
On putting them in, make certain that the couplings are  
properly assigned!

Watch for proper seating and latching of the spring con-  
tacts in the plugs! It must not be possible to shove the  
spring contacts back!



1 = Rotational-speed sensor  
2 = Reference mark sensor  
Arrow = Identification marking for  
reference mark sensor

Defective rotational-speed sensor  
signal



**E11**

Testing with universal test adapter  
BMW 325e (USA)



**E12**

Testing with universal test adapter  
BMW 325e (USA)





# TEST STEP 17:

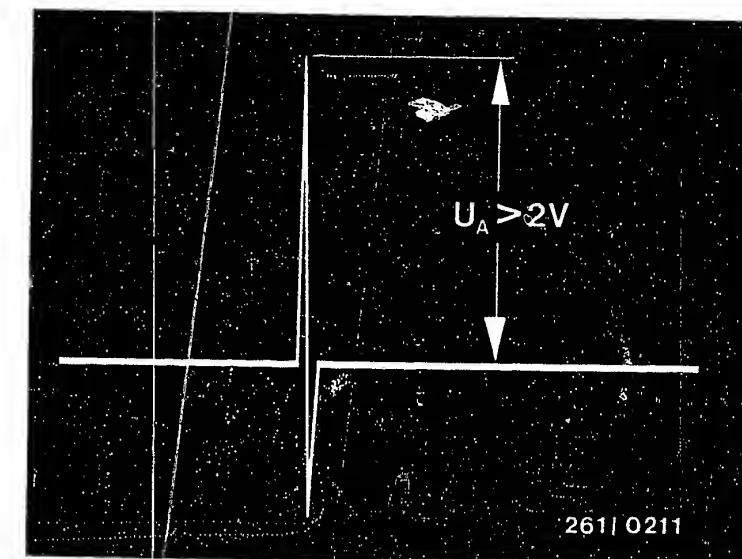
Operation		Reading	Testing
Program switch "V" in setting	2	Reference mark sensor - signal (see figure at top)	Component: Reference mark sensor
Program switch "Ω" in setting:	15		
Test equipment: Motortester, oscilloscope		<div><div>yes</div><div>Continue test- ing with test step 20. (Test steps 18 and 19 are not used.)</div></div> <div><div>no</div><div></div></div>	Operation: Amplitude (signal) at Terminals 25 and 26
Scale: Special input			Malfunction: No signal or too small a signal.  Incorrect signal: Negative peak comes first.
Connection: Test wells, red clip to red well, black clip to black well			
Operation in vehicle: Shift into neutral and start the engine.			

## Trouble-shooting:

No signal, or too small a signal:

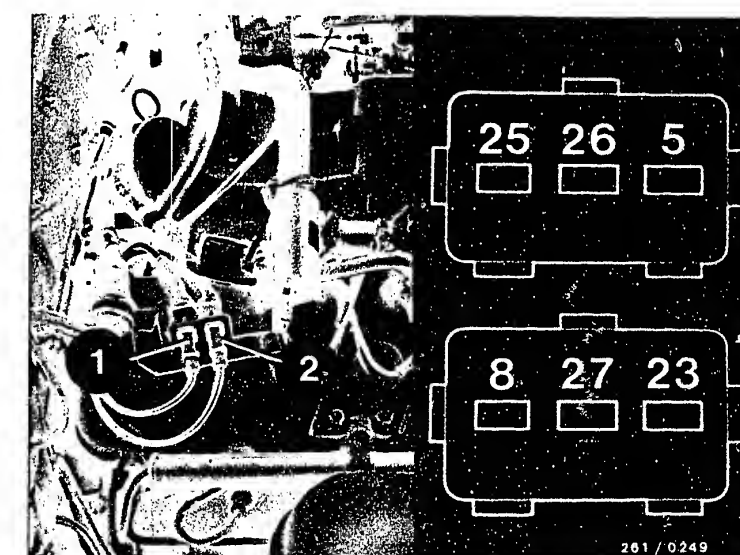
- Cranking speed under 200 min : Charge the battery.

Continued on E15/E16



Reference mark sensor signal  
Positive peak must come first.

- 1 = Plug connection for reference mark sensor with gray plug
- 2 = Plug connection for rotational-speed sensor, with black plug



**E13**

Testing with universal test adapter  
BMW 325e (USA)



**E14**

Testing with universal test adapter  
BMW 325e (USA)



## Trouble-shooting TEST STEP 17 (continued)

- Check the nominal air gap  $a = 0.8 \text{ mm}$ :  
Remove the coverplate from the ring gear housing  
The reference mark (3) can be moved up to the reference mark sensor by turning the ring gear, e.g., with a wrench. Measurement of the air gap (a) with a feeler gauge.

### Incorrect signal:

- The signal is incorrect if the negative peak comes first.  
Check assignment of leads according to the wiring diagram and the figure at the right.
- Taking out and replacing the reference mark sensor:  
Unscrew the socket hex screw on the sensor. Remove dirt deposits on the sensor. If necessary, insert two screwdrivers into the recesses at the left and the right of the sensor and lift the sensor.

Before putting the sensor in, make certain that no metal parts cling to it. (The sensors contain permanent magnets.) Grease the sensors with Molykote Longterm.

**Do not confuse the sensors one for the other on installation!**

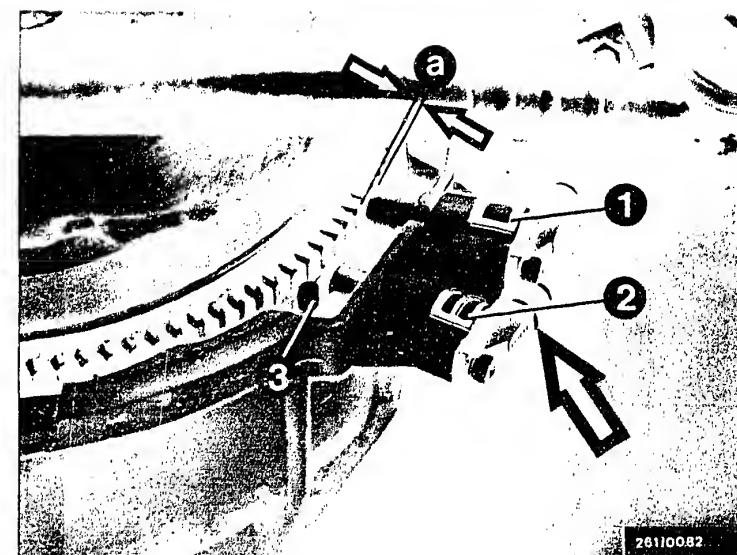
### Watch the identification marking:

The reference mark sensor is identified with a cable binder

The sensors are inserted into the hole down to the stop, and screwed tight. Do not use any force when putting them in.

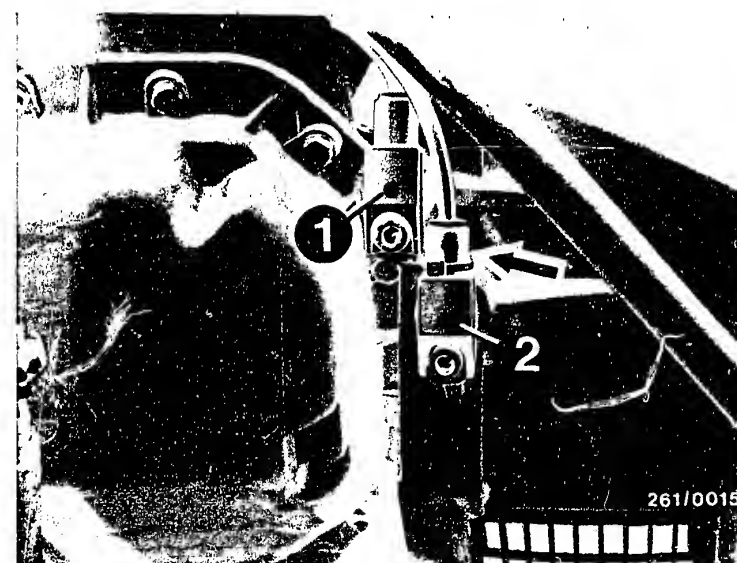
On assembly, make certain that the couplings are correctly assigned!

Make certain that there is a proper seating and latching of the spring contacts in the plug! It must not be possible to shove the spring contacts back!



1 = Rotational-speed sensor (D)  
2 = Reference mark sensor (B)  
3 = Reference mark  
a = Air gap  
Arrow = Identification marking for reference mark sensor

1 = Rotational-speed sensor  
2 = Reference mark sensor  
Arrow = Identification marking on the reference mark sensor



**E15**

Testing with universal test adapter  
BMW 325e (USA)



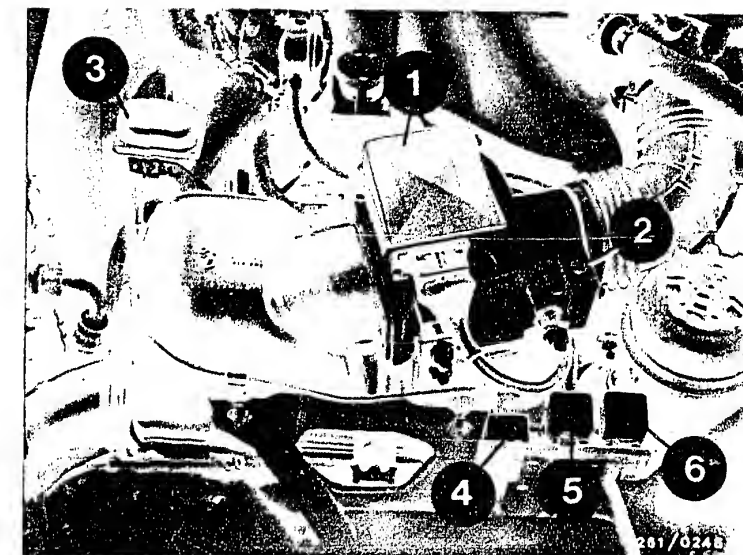
**E16**

Testing with universal test adapter  
BMW 325e (USA)



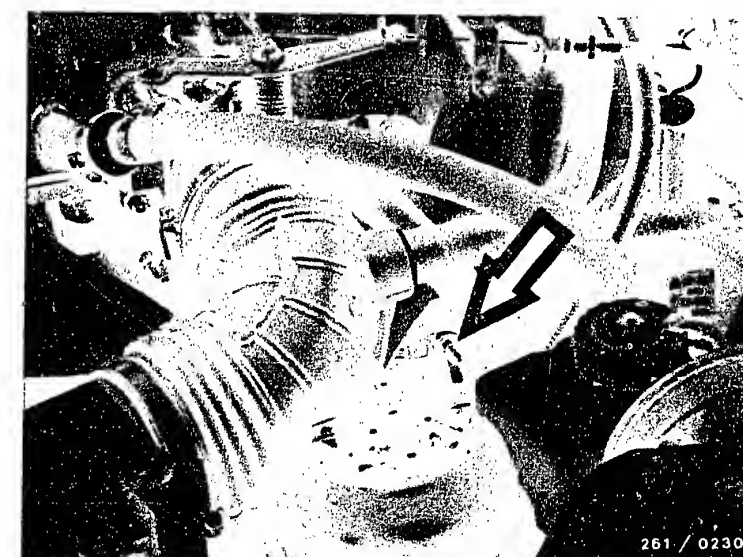


TEST STEP 20: (Test steps 18 and 19 are not used.)			
Operation		Reading	Testing
Program switch "V" in setting:	6	Voltmeter must read <u>10 ... 15 V.</u>	Component: Relay 2 (main relay)
Program switch "Ω" in setting:	15		
Test equipment:		<div> <div>yes</div> <div>↓</div> <div>Continue test- ing with <u>next</u> test step.</div> </div> <div>no</div>	Operation: Supply voltage for the control unit at terminals 35 (+) and 5 (ground)
Voltmeter			
Scale:			
15 V			
Connection:			Malfunction: Voltage less than 10 V
Test sockets (red = +, black = ground)	V		
Operation in vehicle: Switch ignition on			



- 4 = Relay 2 (main relay)  
5 = Relay for sensor heater  
6 = Relay 1 (pump relay)

Arrow = Motronic ground terminal



#### Trouble-shooting:

1. Voltage less than 10 V: Battery insufficiently charged, or high voltage drops at the terminal points.
2. No reading for voltage: Check relay 2. Take the following measurements for voltage at the relay with the ignition switched on:
  - Measure battery voltage at Term. 87 (2x), Term. 86. and Term. 30.  
Measure the ground connection Term. 85 to B+ (test adapter connected).
  - Check the lead from relay 2 Term. 87 to the control unit plug Term. 35.
  - Check the Motronic ground terminal, and lead 5

Note: When taking out and replacing relay 2, be certain to install only a relay with a blocking diode! Watch the wiring symbol on the relay housing!

**E17**

Testing with universal test adapter  
BMW 325e (USA)

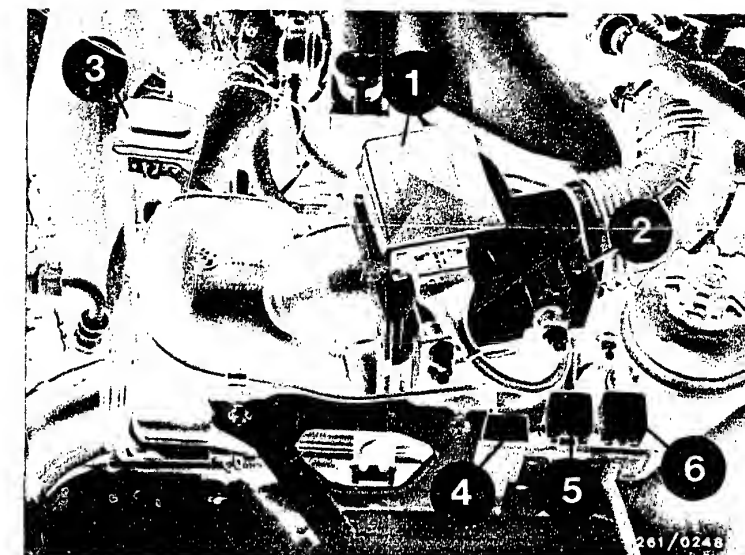


**E18**

Testing with universal test adapter  
BMW 325e (USA)



TEST STEP 21:		
Operation		Reading
Program switch "V" in setting:	7	Voltmeter must read 10 ... 15 V.
Program switch "Ω" in setting:	15	
Test equipment: Voltmeter		<div> <div>yes</div> <div>↓</div> <div>Continue test- ing with <u>next</u> test step.</div> </div> <div>no</div> <div>↓</div>
Scale: 15 V		
Connections: Test sockets (red = +, black = ground)	V	
Operation in vehicle: Switch ignition on		
		Component: Relay 2 (main relay)
		Operation: Supply voltage for the control unit at terminals 18 (+) and 5 (ground)
		Malfunction: Voltage less than 10 V



4 = Relay 2 (main relay)  
 5 = Relay for sensor heater  
 6 = Relay 1 (pump relay)

#### Trouble-shooting:

- Check lead from the control unit plug Term. 18 to relay 2 Term. 87.

Note: When taking out and replacing relay 2, make certain that only a relay with a blocking diode is installed! Watch the wiring symbol on the relay housing!

**E19**

Testing with universal test adapter  
BMW 325e (USA)

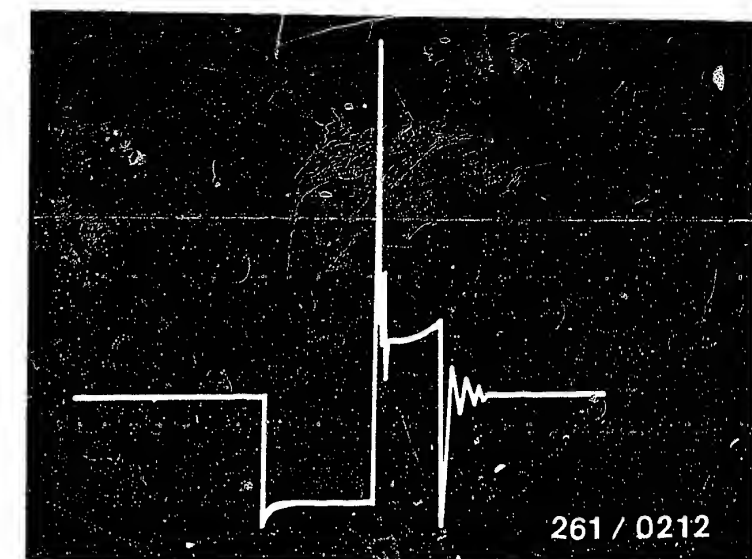


**E20**

Testing with universal test adapter  
BMW 325e (USA)

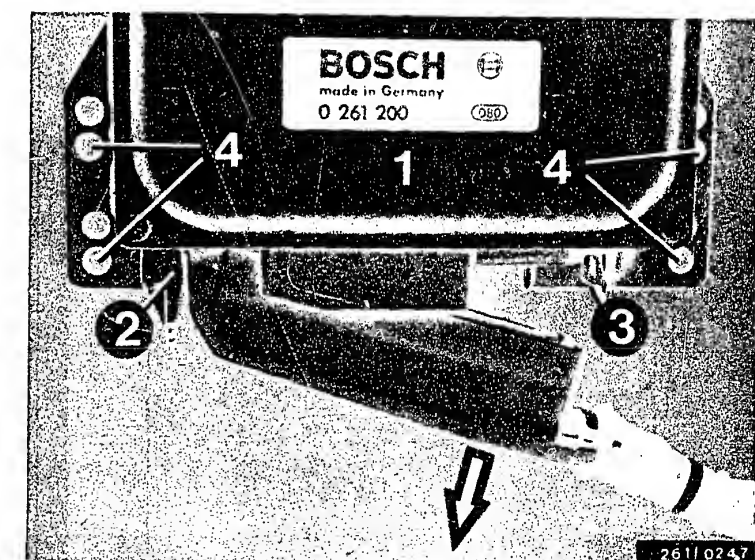


TEST STEP 22 Ignition off, connect control unit. Test chart is valid for control unit 0 261 200 021		
Operation	Reading	Testing
Program switch "V" in setting: 5	Primary signal present (see figure at top).	Component: Ignition coil, ignition leads. Control unit
Program switch "Ω" in setting: 15		
Test equipment: Motortester, oscilloscope	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <div style="border-top: 1px solid black; width: 50px; margin: 0 auto;"></div> <div style="margin: 5px 0;">yes</div> <div style="border-left: 1px solid black; height: 100px; position: relative;"> <div style="position: absolute; top: 0; left: 50%; transform: translateX(-50%);">↓</div> <div style="position: absolute; bottom: 0; left: 50%; transform: translateX(-50%);">Continue testing with next test step.</div> </div> </div> <div style="text-align: center;"> <div style="border-top: 1px solid black; width: 50px; margin: 0 auto;"></div> <div style="margin: 5px 0;">no</div> <div style="border-left: 1px solid black; height: 100px; position: relative;"> <div style="position: absolute; top: 0; left: 50%; transform: translateX(-50%);">↓</div> </div> </div> </div>	Operation: Primary signal from ignition coil Terminal 1 to ground
Scale: Special input		Malfunction: No signal or incorrect signal
Connection: Test wells. Red clip to red well, black clip to black well. Triggering at cylinder 1.		
Operation in vehicle: Shift into neutral and start the engine		



Primary signal

- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes



#### Trouble-shooting:

- Checking the Motronic ground terminal:  
The terminal point must be bright and the screw must be tightened firmly.
- Check the ignition coil including the leads and the high voltage leads.  
It must not be possible to shove back the spring contact on control unit plug Term. 1.
- Check the lead from ignition coil Term. 15 to the ignition lock Term. 15.
- Take out and replace the control unit.

#### Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.

**E21**

Testing with universal test adapter  
BMW 325e (USA)

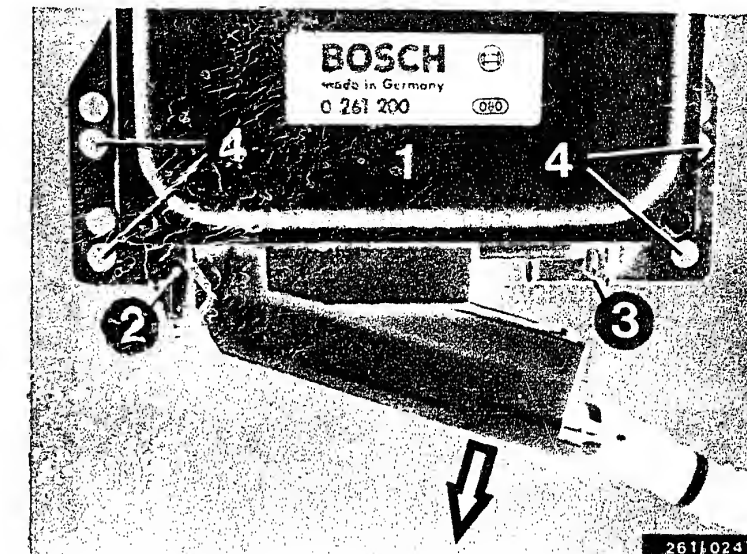


**E22**

Testing with universal test adapter  
BMW 325e (USA)



TEST STEP 23			
Operation		Reading	Testing
Program switch "V" in position:	8	Voltmeter must read greater than 8 V.	Component:  Control unit
Program switch "Ω" in position:	15		
Test equipment:		<div><div>yes</div><div>↓</div><div>Continue testing with next test step</div></div> <div>no</div>	Operation:  Supply voltage for air-flow sensor at Terminal 9 and ground.   Malfunction:  Voltage less than 8 V
Voltmeter			
Scale:			
15 V			
Connection:	V		
Test sockets, (red = +, black = ground)			
Operation in vehicle:			
Switch ignition on			



- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes

#### Trouble-shooting

- Take out and replace the control unit.

#### Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.

**E23**

Testing with universal test adapter  
BMW 325e (USA)



**E24**

Testing with universal test adapter  
BMW 325e (USA)

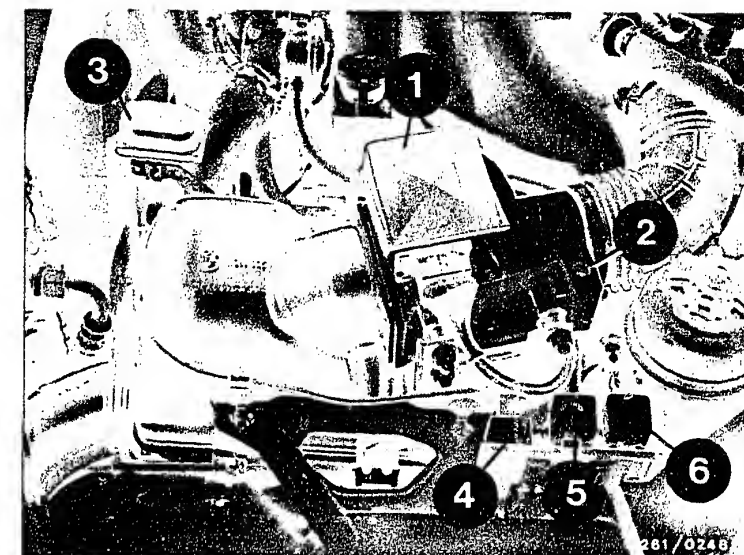


TEST STEP 24			
Operation		Reading	Testing
Program switch "V" in position:		9	Component: Air-flow sensor
Program switch "Ω" in position:		15	
Test equipment: Voltmeter		With the air-flow sensor flap closed, voltmeter must read: 150 ... 250 mV.	
Scale: 1.5 V			
Connection: Test sockets (red = +, black = ground)		V	Operation: Divider voltage at Terminal 7 and ground
Operation in vehicle: Ignition on		yes ↓ Continue testing with test step 27. (Test steps 25 and 26 are not used.)	
		no ↓	Malfunction: No voltage or voltage less than 150 mV or greater than 250 mV

#### Trouble-shooting:

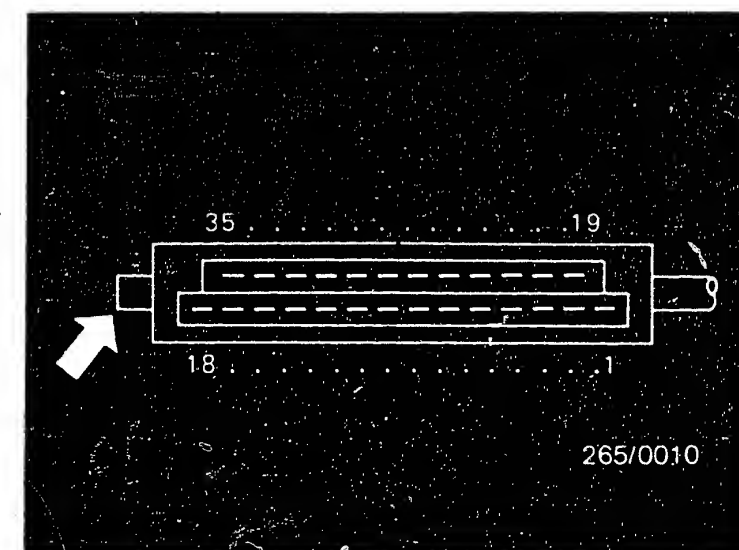
##### No reading:

- Check the lead from the air-flow sensor Term. 6, 7, and 9 to the control unit plug Term. 6, 7, and 9!
  - It must not be possible to shove the spring contacts back.
- If the reading is not within tolerance:
- Check whether the air-flow sensor flap closes completely.
  - Take out and replace the air-flow sensor.



- 1 = Air-flow sensor with NTC I  
2 = Idle-mixture-adjusting screw

Top view of control unit plug (35-pole), with terminal numbers.  
Arrow = "Lug", with mechanical coding



265/0010

**F1**

Testing with universal test adapter  
BMW 325e (USA)



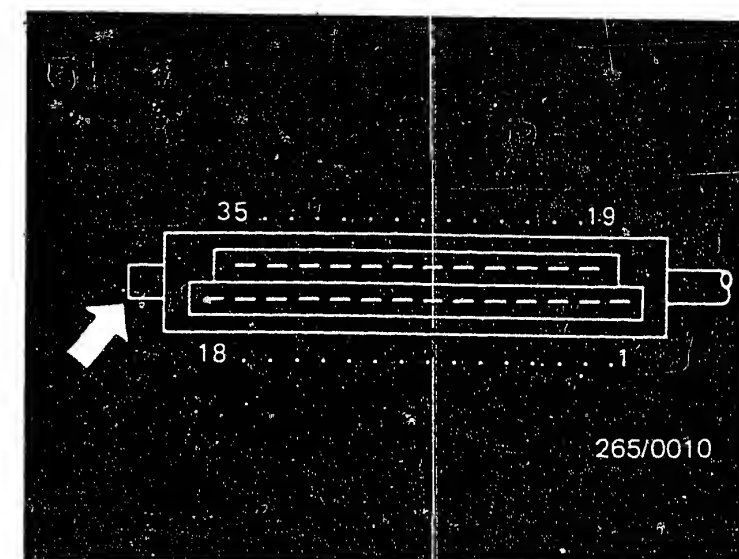
**F2**

Testing with universal test adapter  
BMW 325e (USA)





TEST STEP 27: (Test steps 25 and 26 are not used)			
Operation		Reading	Testing
Program switch "V" in setting:	12	During the starting process, the voltmeter must read  <u>8 ... 15 V</u>	<u>Component:</u> Lead 4 from the starting motor Term. 50 to the control unit plug Term. 4
Program switch "Ω" in setting:	15		
Test equipment. Voltmeter		<div>yes</div> <div>no</div>	<u>Operation:</u> Voltage test at Terminal 4
Scale 15 V			
Connection: Test sockets (red = +, black = ground)	V		<u>Malfunction:</u> Voltage less than 8 V
Operation in vehicle: Shift into neutral and start the engine.			



Top view of control unit plug (35-pole), with terminal numbers. Arrow = "Lug", with mechanical coding

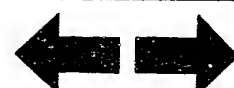
# Trouble-shooting:

## 1. Voltage less than 8 V:

- Check the voltage at the starting motor Terminal 50.
- Check the lead from the control unit plug Terminal 4 to the starting motor Terminal 50.

F3

Testing with universal test adapter  
BMW 325e (USA)

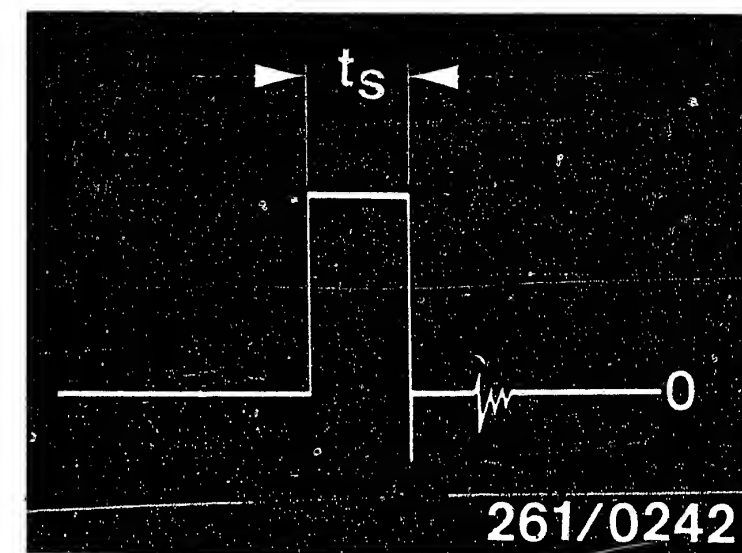


F4

Testing with universal test adapter  
BMW 325e (USA)



TEST STEP 28:			
Operation		Reading	Testing
Program switch "V" in setting	13	Dwell period signal (See Figure at top)	Component: Control unit
Program switch "Ω" in setting	15		
Test equipment: Motortester, oscilloscope		<div><div>yes</div><div>↓</div><div>Continue test- ing with <u>next</u> test step.</div></div>	Operation: Dwell period signal at Terminal 21 and ground
Scale: Special input			Malfunction: No signal
Connection: Test wells. Red clip to red well, black clip to black well.			
Operation in vehicle: Shift into neutral and start the engine.			



$t_s$  = Dwell period  
0 = Zero line

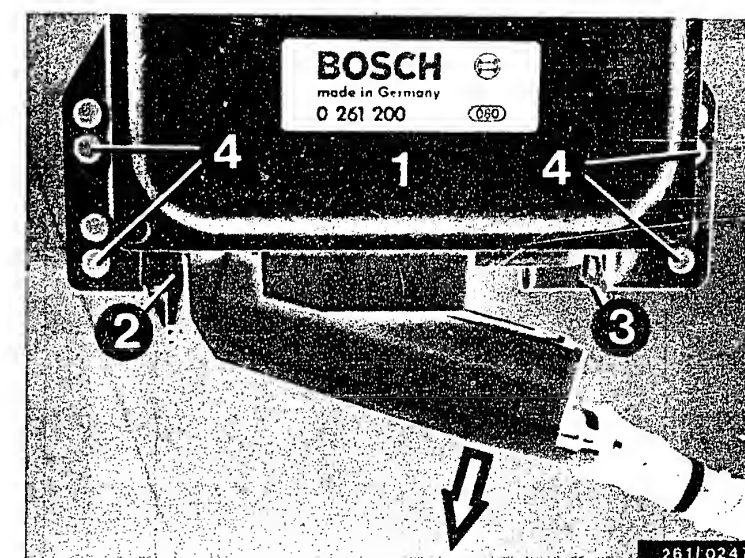
- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes

#### Trouble-shooting:

- Take out and replace the control unit.

#### Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.



**F5**

Testing with the universal test adapter  
BMW 325e (USA)



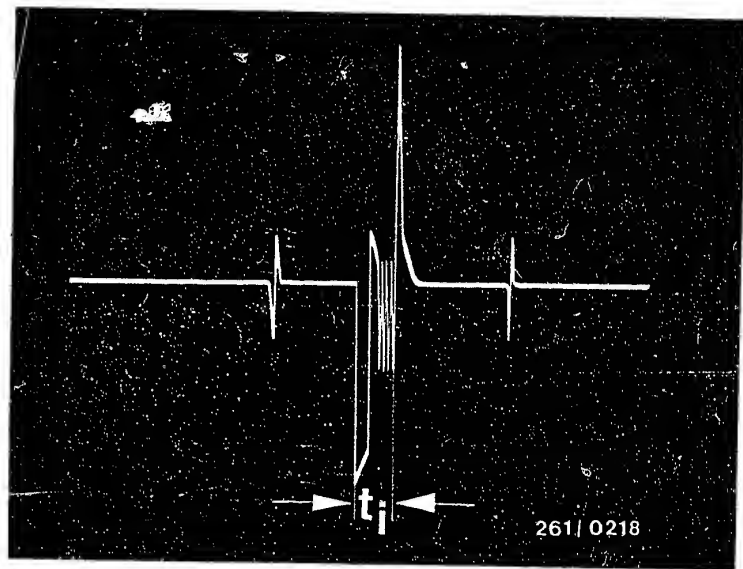
**F6**

Testing with the universal test adapter  
BMW 325e (USA)





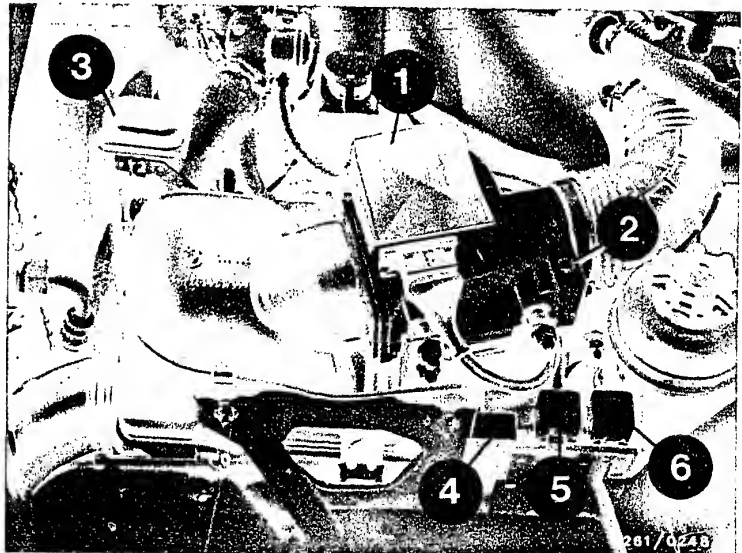
TEST STEP 29			
Operation		Reading	Testing
<u>Program switch "V" in setting:</u>	14	<u>Fuel-injection signal</u> (See Figure at top)	<u>Component:</u> Power supply for solenoid-operated fuel-injection valves, control unit
<u>Program switch "Ω" in setting:</u>	15		
<u>Test equipment:</u> Motortester, oscilloscope		<div><div>yes</div><div>↓</div><div>Continue test- ing with <u>next</u> test step.</div></div> <div><div>no</div><div>↓</div></div>	<u>Operation:</u> Fuel-injection output stage at Terminal 14 and ground
<u>Scale:</u> Special input			
<u>Connection:</u> Test wells. Red clip to red well, black clip to black well.			<u>Malfunction:</u> No signal
<u>Operation in vehicle:</u> Shift into neutral and start the engine.			



$t_i$  = Fuel injection period

Watch for interference (interference pulses).

- 4 = Relay 2 (main relay)
- 5 = Relay for sensor heater
- 6 = Relay 1 (pump relay)



#### Trouble-shooting:

- Check the power supply for the solenoid-operated fuel-injection valves:  
Disconnect the connector from all the solenoid-operated fuel-injection valves. Measure the voltage at the two terminals on the valve connector. Battery voltage must be measured once at each valve connector. If there is no voltage present, check the lead from the valve connector to relay 2, Term. 87.
- Check the lead from the control unit plug Term. 14 to the solenoid-operated fuel-injection valves for Cylinders 1, 2, and 3.
- Take out and replace the control unit.

#### Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.

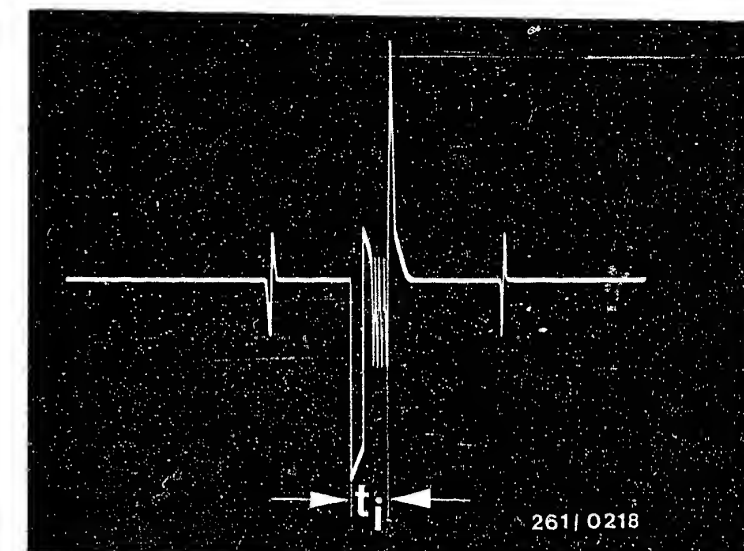
TEST STEP 30			
Operation		Reading	Testing
<u>Program switch "V" in setting:</u>	14	After button T1 (NTC II, cold) is pressed, the duration of injection $t_i$ becomes somewhat longer.  <u>Press T1 only briefly, or the engine will be supplied too richly.</u>	<u>Component:</u> Control unit
<u>Program switch "Ω" in setting:</u>	15		
<u>Test equipment:</u> Motortester, oscilloscope			
<u>Scale:</u> Special input		<div>yes</div> <div>no</div> <div>↓</div> <div>Continue test- ing with <u>next</u> test step.</div>	<u>Operation:</u> Effect of temperature
<u>Connection:</u> Test wells. Red clip to red well, black clip to black well.			
<u>Operation in vehicle:</u> Shift into neutral and start the engine			
<u>Button:</u> Press T1			
			<u>Malfunction:</u> The signal does not become wider when T1 is pressed.

#### Trouble-shooting:

Take out and replace the control unit.

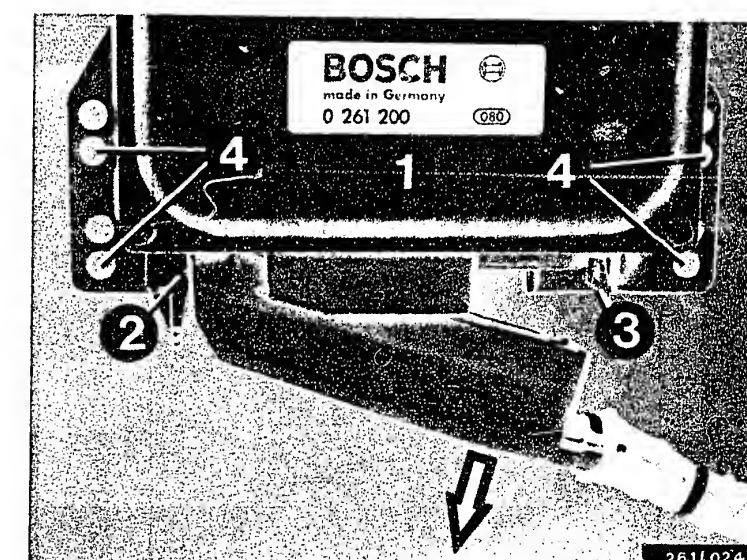
#### Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.



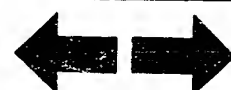
Fuel-injection signal  
 $t_i$  = Fuel-injection time

- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes



**F9**

Testing with the universal test adapter  
BMW 325e (USA)

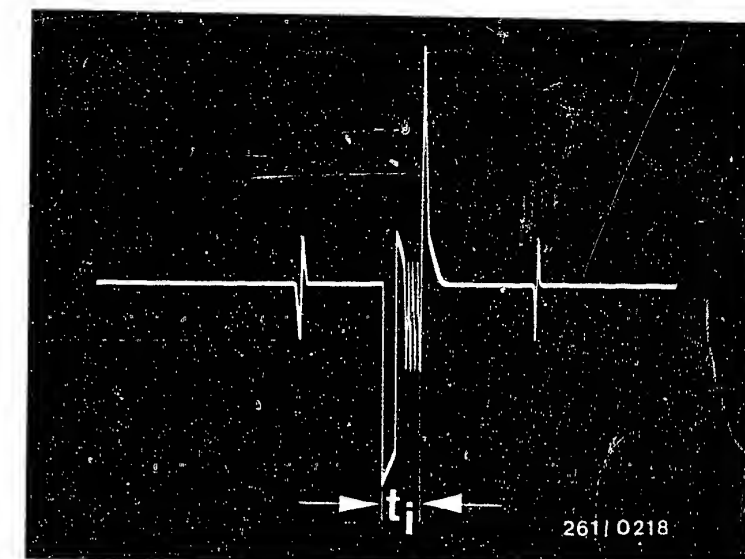


**F10**

Testing with the universal test adapter  
BMW 325e (USA)



TEST STEP 31		Reading	Testing
Operation			
Program switch "V" in setting:	15	Fuel-injection signal (See Figure at the top)	Component: Control unit
Program switch "Ω" in setting:	15		
Test equipment: Motortester, oscilloscope			
Scale: Special input		yes	Operation: Fuel-injection output stage at Terminal 15 and ground
Connection: Test wells. Red clip to red well, black clip to black well.		no	Malfunction: No signal
Operation in vehicle: Shift into neutral and start the engine.		Continue test- ing with next test step.	



Fuel-injection signal  
ti = Fuel-injection time

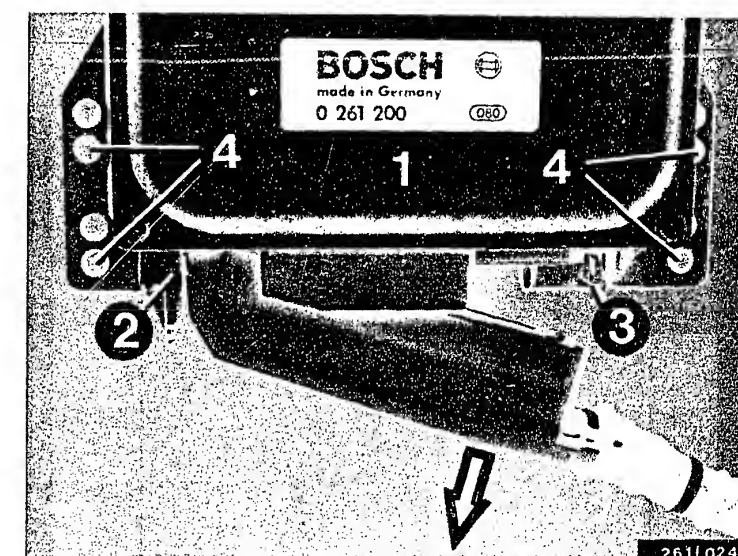
- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes

#### Trouble-shooting:

- Check the power supply for the solenoid-operated fuel-injection valves. Disconnect the connectors from all the solenoid-operated fuel-injection valves. Measure the voltage at both terminals on the valve connector. Battery voltage must be measured once at each valve connector. If there is no voltage present, check the lead from the valve connector to relay to Term. 87.
- Check the lead from the control unit plug Term. 15 to the solenoid-operated fuel-injection valves for cylinders 4, 5, and 6.
- Take out and replace the control unit.

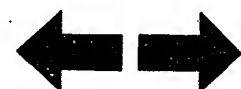
#### Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.



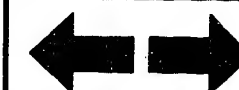
**F11**

Testing with the universal test adapter  
BMW 325e (USA)



**F12**

Testing with the universal test adapter  
BMW 325e (USA)



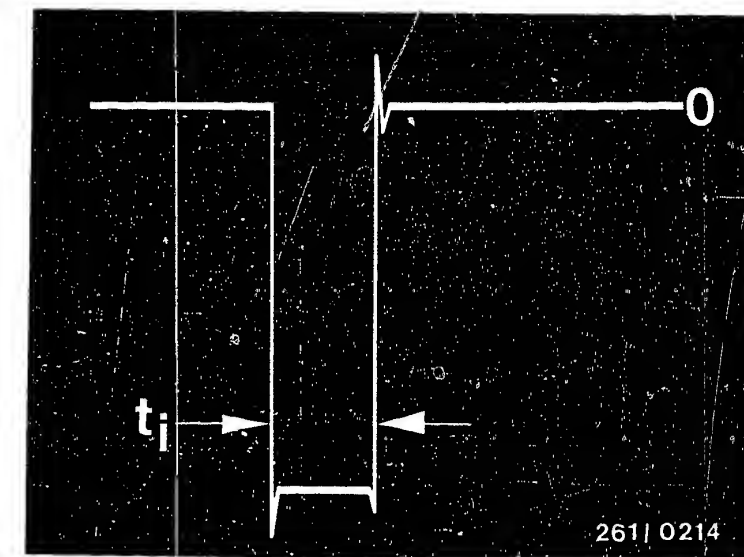
TEST STEP 32			
Operation		Reading	Testing
<u>Program switch "V" in setting:</u>	16	<u>Fuel-injection signal</u> (See Figure at top)	<u>Component:</u> Control unit
<u>Program switch "Ω" in setting:</u>	15		
<u>Test equipment:</u> Motortester, oscilloscope		<div><div>yes</div><div>↓</div><div>Continue test- ing with <u>next</u> test step.</div></div> <div><div>no</div><div>↓</div></div>	<u>Operation:</u> Fuel-injection signal at Terminal 11 and ground
<u>Scale:</u> Special input			<u>Malfunction:</u> No signal
<u>Connection:</u> Tests wells. Red clip to red well, black clip to black well.			
<u>Operation in vehicle:</u> Shift into neutral and start the engine.			

#### Trouble-shooting:

Take out and replace the control unit.

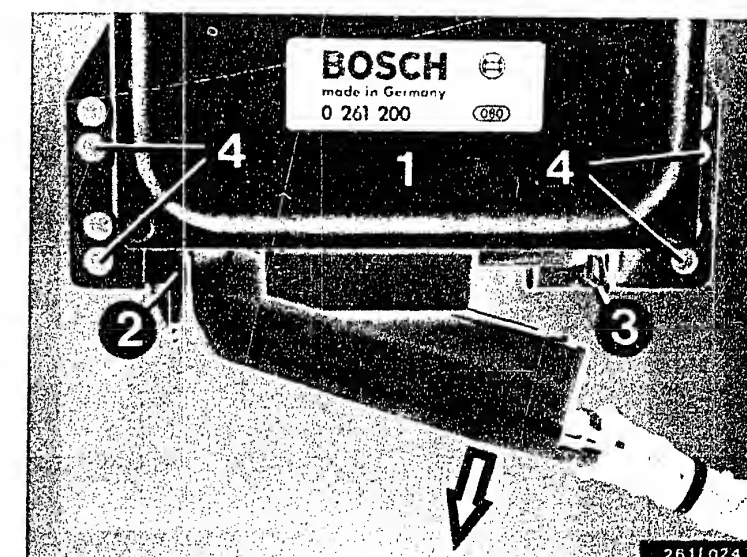
#### Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.



tj = Fuel-injection  
0 = Zero line

- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes



**F13**

Testing with the universal test adapter  
BMW 325e (USA)



**F14**

Testing with the universal test adapter  
BMW 325e (USA)





# TEST STEP 33: Plug in relay 1 (pump relay).

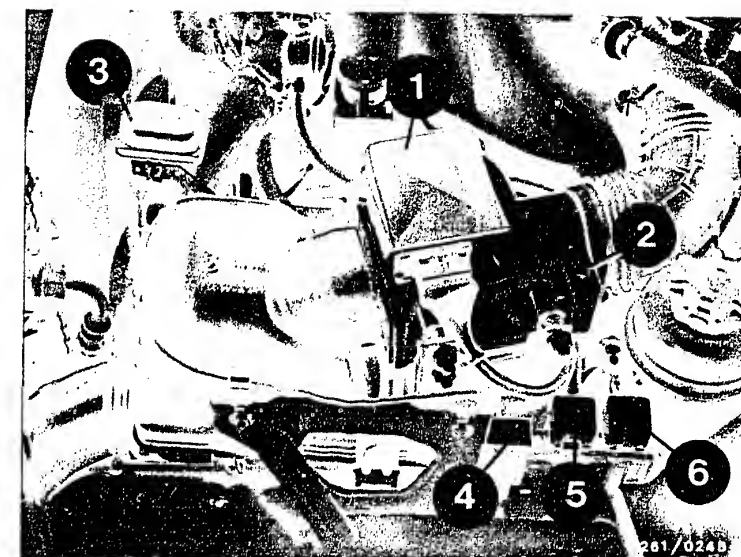
Operation		Reading	Testing
<u>Program switch "V"</u> in setting:	17	Voltmeter must read <u>10 ... 15 V</u>	<u>Component:</u> Relay 1 (pump relay)
<u>Program switch "Ω"</u> in setting:	15		
<u>Test equipment:</u> Voltmeter		<div><div>yes</div><div>↓</div><div>Continue test- ing with <u>next</u> test step.</div></div> <div><div>no</div><div>↓</div></div>	<u>Operation:</u> Voltage at Term. 20 to ground
<u>Scale:</u> 15 V			
<u>Connection:</u> Test sockets; (red = +, black = ground)	V		
<u>Operation in vehicle:</u> Switch ignition on			
			<u>Malfunction:</u> Voltage less than 10 V

## Trouble-shooting:

- Take out and replace relay 1.
- Check the lead from control unit plug Term. 20 to relay 1 Term. 85.
- Take out and replace the control unit.

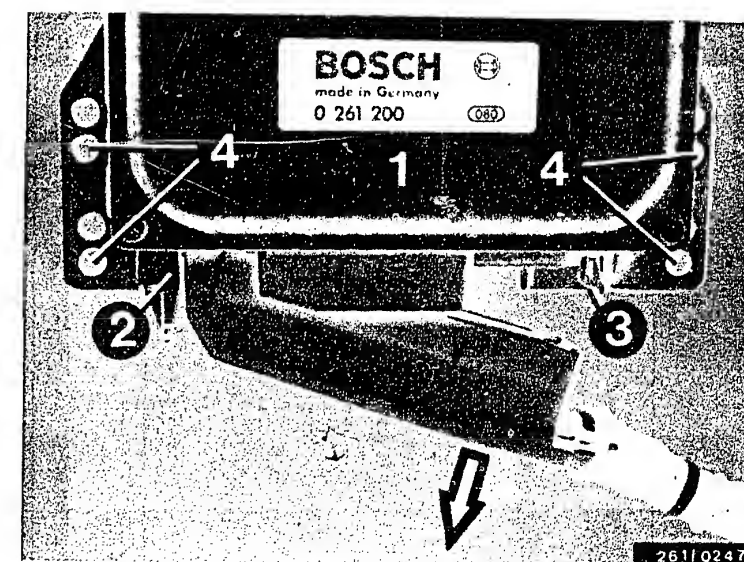
## Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.



- 4 = Relay 2 (main relay)
- 5 = Relay for sensor heater
- 6 = Relay 1 (pump relay)

- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes



F15

Testing with the universal test adapter  
BMW 325e (USA)

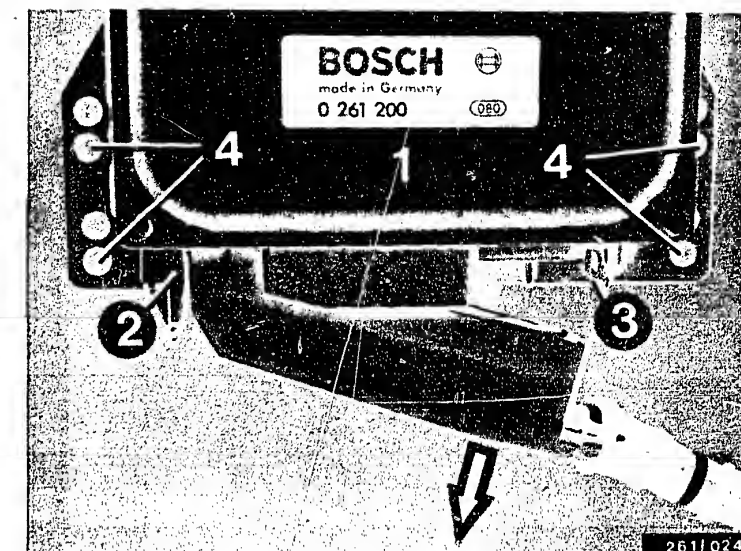


F16

Testing with the universal test adapter  
BMW 325e (USA)



TEST STEP 34:			
Operation		Reading	Testing
<u>Program switch "V"</u> <u>in setting:</u>	17	Voltmeter must read <u>max. 4 V</u>	<u>Component:</u> Control unit
<u>Program switch "Ω"</u> <u>in setting:</u>	15		
<u>Test equipment:</u> Voltmeter		<div><div>yes</div><div>↓</div><div>Continue test- ing with <u>next</u> test step.</div></div> <div>no</div> <div>↓</div>	<u>Operation:</u> Pump control Term. 20 to ground
<u>Scale:</u> 15 V			
<u>Connection:</u> Test sockets; (red = +, black = ground)	V		
<u>Operation in vehicle:</u> Shift into neutral and start the engine.			
			<u>Malfunction:</u> Voltage greater than 4 V



- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes

#### Trouble-shooting:

Take out and replace the control unit.

#### Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.

**F17**

Testing with the universal test adapter  
BMW 325e (USA)



**F18**

Testing with the universal test adapter  
BMW 325e (USA)



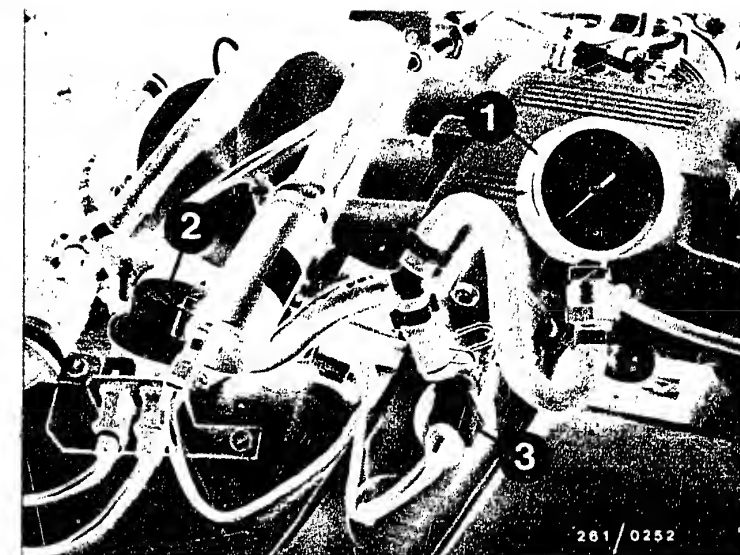


TEST STEP 35 <u>Switch ignition off, connect pressure guage.</u>			
<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
<u>Program switch "V"</u> <u>in setting:</u>	17	<u>2.3 to 2.7 bar</u>	<u>Component:</u> Pump relay, fuel pump, pressure regulator, fuel filter
<u>Program switch "Ω"</u> <u>in setting:</u>	15		
<u>Test equipment:</u> Pressure gauge		<div><div>yes</div><div>↓</div><div>Continue test- ing with <u>next</u> test step.</div></div> <div>no</div> <div>↓</div>	<u>Operation:</u> Fuel pressure
<u>Scale:</u> 0 to 6 bar			
<u>Connection:</u> In the fuel delivery line			
<u>Operation in vehicle:</u> Switch ignition on			
<u>Button:</u> Press T3			
			<u>Malfunction:</u> No fuel pressure or pressure not within tolerance

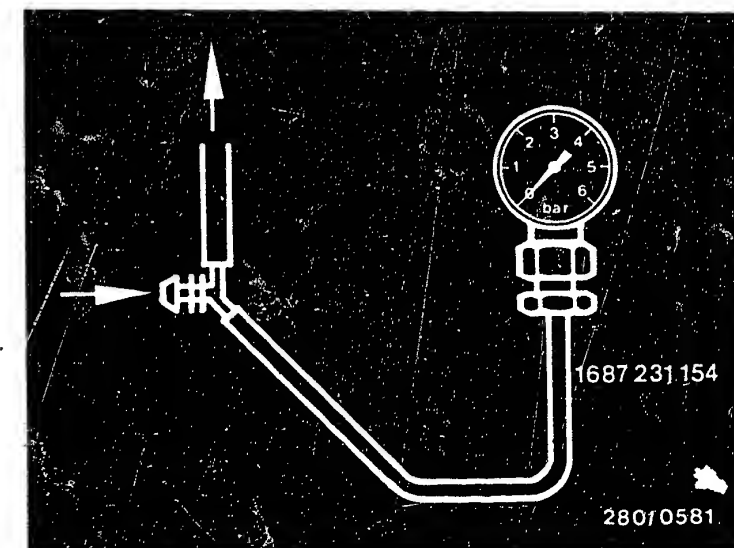
#### Note:

Put the pressure gauge (1) into the fuel delivery line at the start valve (3). Catch any gasoline that runs out! Fire hazard with hot engine and electrical sparks!

Continued on F21/F22



- 1 = Pressure gauge
- 2 = Fuel-line-pressure damper  
in the fuel delivery line
- 3 = Start valve



**F19**

Testing with the universal test adapter  
BMW 325e (USA)



**F20**

Testing with the universal test adapter  
BMW 325e (USA)



### TEST STEP 35, Continued

When using pressure tester KDJE-P 100, the valve screw must be screwed shut.

Make certain connections do not leak!

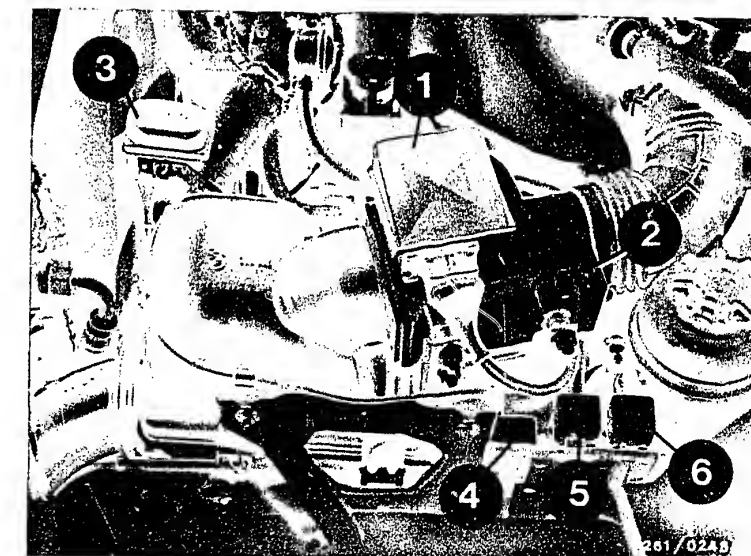
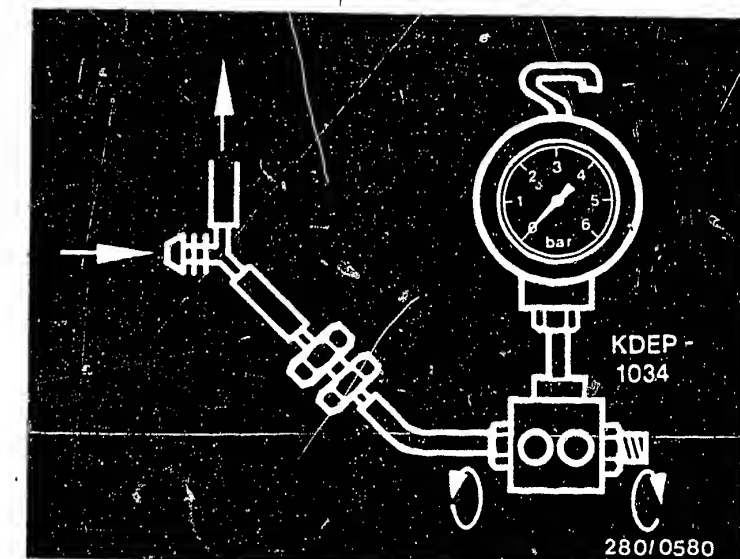
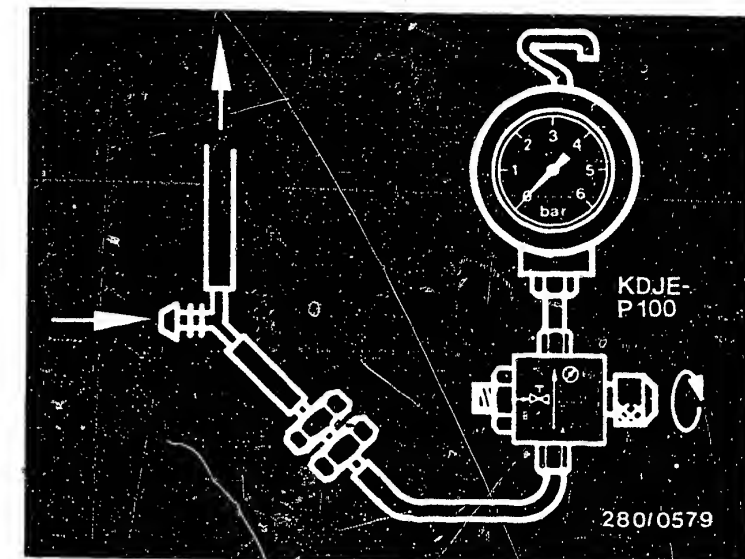
Switch ignition on. To measure pressure, press button T3.

### Trouble-shooting, TEST STEP 35

#### 1. Pressure 0 bar, no pump noises audible:

- Check pump fuse (No. 11 in the fuse box).
- Take out and replace relay 1 (pump relay) (6).

Continued on F23/F24



**F21**

Testing with the universal test adapter  
BMW 325e (USA)



**F22**

Testing with the universal test adapter  
BMW 325e (USA)



Trouble-shooting, TEST STEP 35 (continued)

- Disconnect pump plug and measure voltage on it.

If there is no voltage present:

Check the lead from the fuel pump to relay 2 Term. 87b and the pump ground lead.

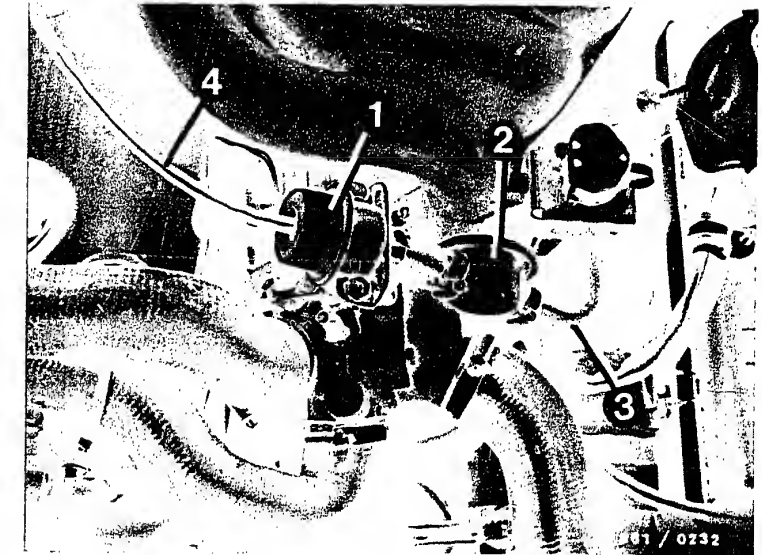
- If there is voltage present:  
Check the pressure regulator and the fuel pump as described below in section 2.

2. Fuel pressure less than 2.3 bar, fuel pump is running:

- Fuel pressure too low:  
Slowly pinch off the return line with a pinching clamp. If the pressure rises above 4 bar, take out and replace the pressure regulator.  
If the pressure remains less than 4 bar, take out and replace the fuel pump.
- Check the fuel line and filter for open passage. Are the fuel lines pinched off?
- Is the tank filter clogged?
- Is there corrosion in the tank?

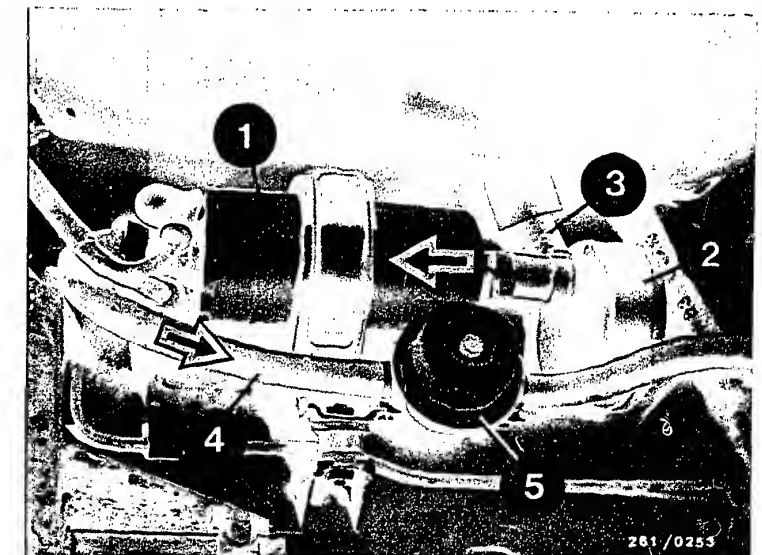
3. Fuel pressure greater than 2.7 bar:

- Fuel return line is clogged or pinched off.
- Take out and replace the pressure regulator.  
The fuel pressure regulator is fastened to the fuel distribution pipe using two fastening screws and across an O-ring.  
After the pressure regulator is take out, the O-ring and the flat ring must be replaced. (Use set of parts 1 287 010 704)



- 1 = Pressure regulator
- 2 = Fuel-line-pressure damper
- 3 = Fuel return hose
- 4 = Air hose to the intake manifold

- 1 = Electric fuel pump
- 2 = Fuel spinner
- 3 = Fuel intake line
- 4 = Fuel delivery line
- 5 = Fuel-line-pressure damper
- Arrows = Direction of through flow



**F23**

Testing with universal test adapter  
BMW 325e (USA)



**F24**

Testing with universal test adapter  
BMW 325e (USA)



**N.B.!**

The following test steps can be run only with the engine running. If the engine does not run, continue according to the trouble-shooting plan you have selected.

Detailed trouble-shooting, see C3-C4

Targeted trouble-shooting, see C5-C10.

For further trouble-shooting, leave the test adapter, control unit, and pressure gauge connected.

**TEST STEP 36** (Connect motortester, diagnosis cable, and CO-tester before the catalytic converter.)

<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
<u>Program switch "V"</u> <u>in setting:</u>	17	To test, switch loads off and disconnect the tank bleeder hose.  1. With engine at normal operating temperature: <u>Idle speed:</u> <u>650 ... 750 min -1</u> <u>CO-level:</u> <u>0.5 ... 0.8 vol. %CO</u>  2. Press button T2: The values must remain unchanged!	<u>Component:</u> Idle speed control (LFR), engine, leaks in intake system
<u>Program switch "Ω"</u> <u>in setting:</u>	15		
<u>Test equipment:</u> Motortester and CO-tester		<div><div>yes</div><div>↓</div><div>Continue testing with <u>next</u> test step.</div></div> <div><div>no</div><div>↓</div></div>	<u>Operation:</u> Idle speed and exhaust gas
<u>Scale:</u> Engine speed and CO			
<u>Connection:</u> Ignition coil, exhaust			
<u>Operation in vehicle:</u> Have engine run at normal operating temperature			<u>Malfunction:</u> Values not within tolerance

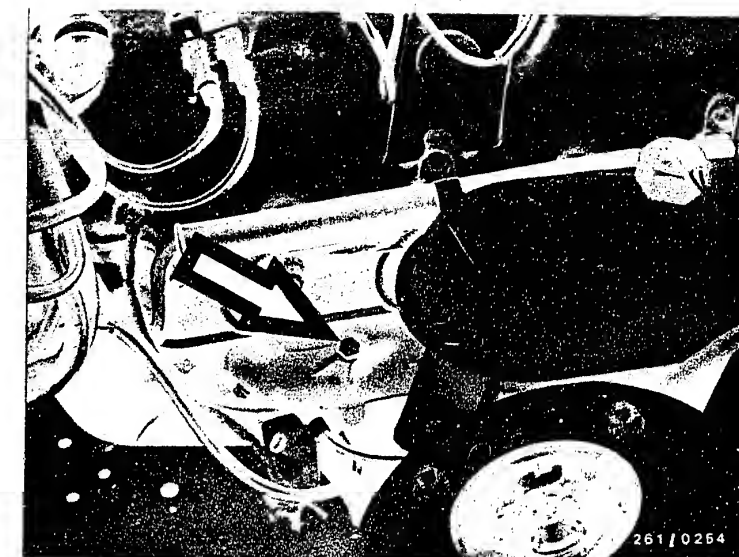
Trouble-shooting:

- Idle speed cannot be adjusted.

Idle speed control (VDO) is defective.

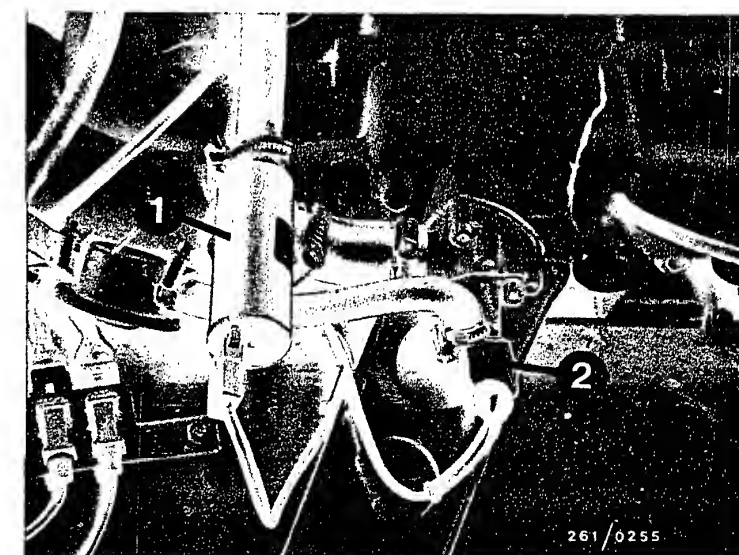
If the engine hunts, take out and replace the idle speed control control unit. Measure the coil resistance of the idle actuator.

Continued on G3



Arrow = CO-connection before the catalytic converter

1 = Idle actuator  
2 = Start valve



**G1**

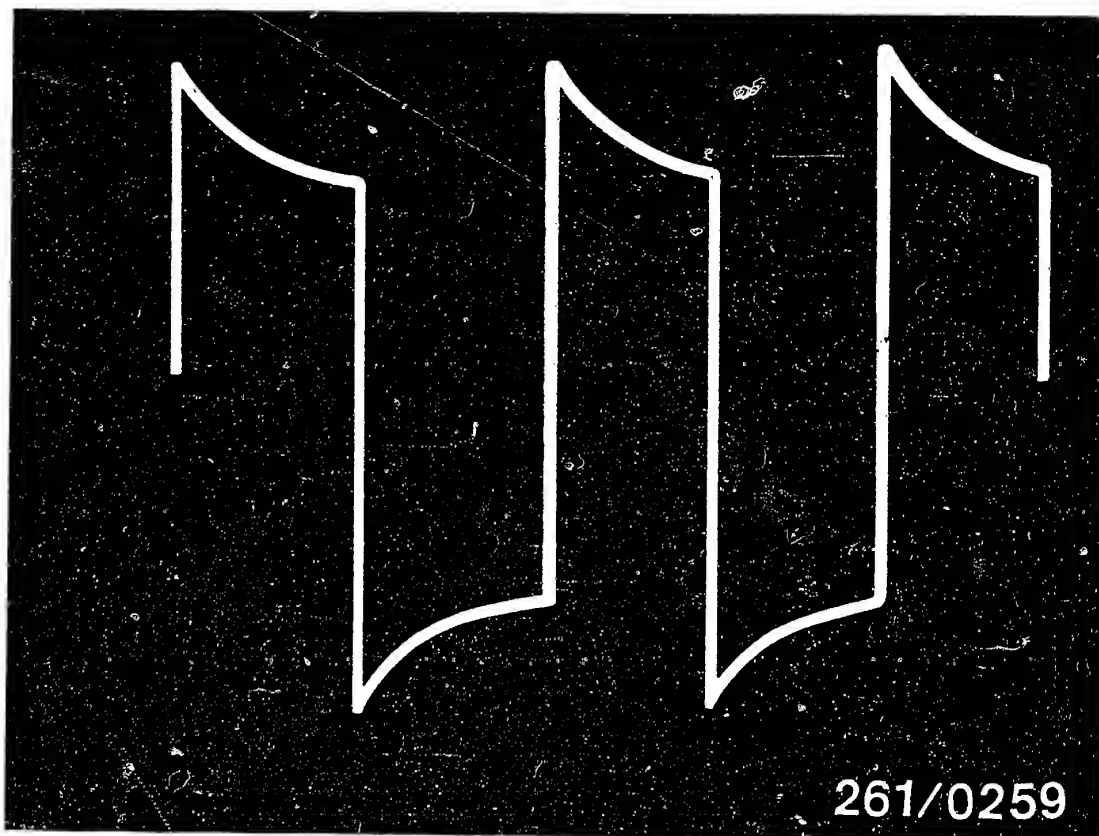
Testing with the universal test adapter  
BMW 325e (USA)



**G2**

Testing with the universal test adapter  
BMW 325e (USA)





Trouble-shooting, TEST STEP 36 (continued)

Measure pulses on the idle actuator.

At idle speed, the pattern shown above must appear on the oscilloscope.

If there are no pulses: check the power supply for the idle speed control control unit and/or take out and replace that control unit.

Further trouble-shooting: the actuator is mechanically defective.

Continued on G4/G5

**G3**

Testing with the universal test adapter  
BMW 325e (USA)





Trouble-shooting, TEST STEP 36 (continued)

- Adjust the exhaust gas using the idle-mixture-adjusting screw (socket hex, AF 5) in the air-flow sensor. To do this, remove the plug in the air-flow sensor using the special tool. After completion of the adjustment, put in a new plug (red).

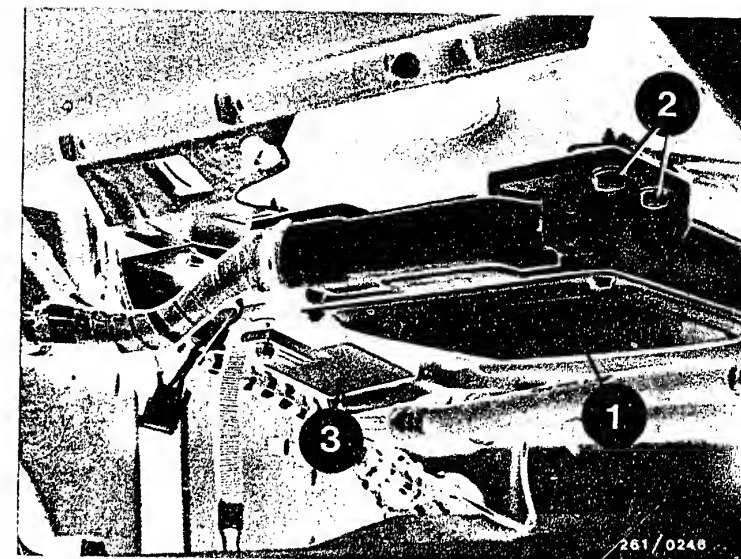
Turning the idle-mixture-adjusting screw clockwise increases the CO-level.

Turning the idle-mixture-adjusting screw counterclockwise reduces the CO-level.

If the exhaust gas value is less than 0.5 vol. %CO and can no longer be adjusted:  
Check the intake end and the exhaust system for leaks (fresh air) by means of a hydrostatic test.

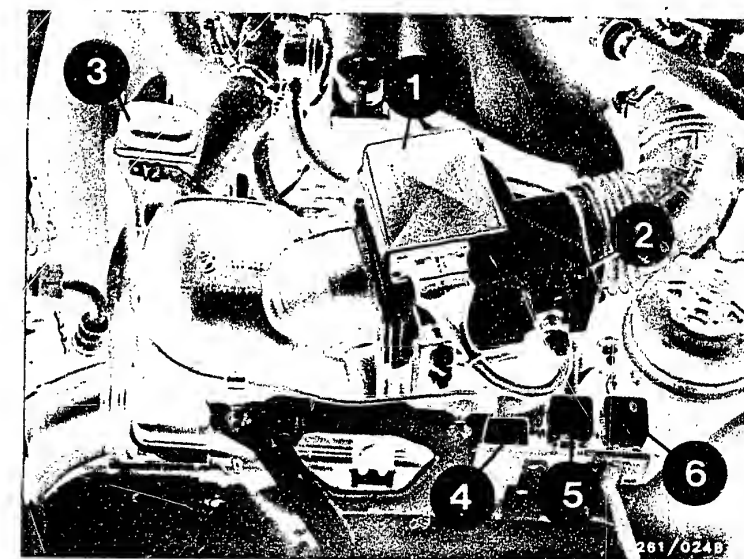
For 2.

If the values do not change when button T2 is pressed, the engine is not yet at normal operating temperature.



3 = Control unit for idle speed control

1 = Air-flow sensor with NTC I  
2 = Idle-mixture-adjusting screw



**G4**

Testing with the universal test adapter  
BMW 325e (USA)



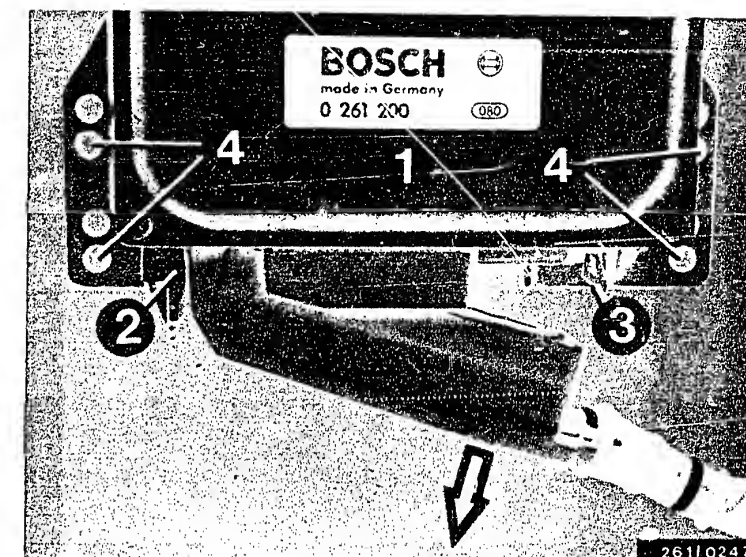
**G5**

Testing with the universal test adapter  
BMW 325e (USA)





TEST STEP 37			
Operation		Reading	Testing
Program switch "V" in setting:	17	1. With engine at normal operating temperature and idle speed: $3^{\circ} \dots 13^{\circ}$ <u>Note:</u> If the idle speed fluctuates, the timing angle also fluctuates. 2. Press button T6 (full load) and increase engine speed to 2700 min <sup>-1</sup> . <u>Timing angle <math>9^{\circ} \dots 15^{\circ}</math></u> To test, cool the engine with an auxiliary fan, because the timing angle is pulled back as the air intake temperature increases (starting from $+30^{\circ} \text{C}$ ).	Component: Control unit
Program switch "Ω" in setting:	15		
Test equipment: Motortester			Operation: Timing angle at idle and full load
Scale: Timing angle			Malfunction: Timing angle not within tolerance
Connection: Diagnosis cable			
Operation in vehicle: Have engine run at normal operating temperature			



- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes

#### Trouble-shooting:

- For 1: recheck the idle speed exactly, and repeat the test step. The idle speed must be between 650 and 750 min<sup>-1</sup> or the readings for timing angle will be different!
- For 2: Run up the engine speed again and take another reading for timing angle. Switch the auxiliary fan on!
- Take out and replace the control unit.

#### Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.

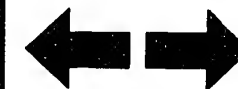
**G6**

Testing with universal test adapter  
BMW 325e (USA)

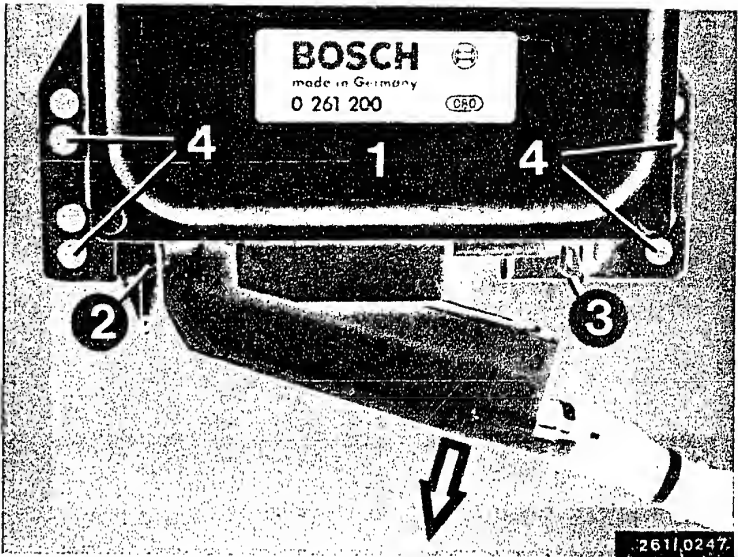


**G7**

Testing with universal test adapter  
BMW 325e (USA)



TEST STEP 38			
Operation		Reading	Testing
Program switch "V" in setting:	17	1. With engine at normal operating temperature and at idle speed: 6° ... 18° 2. At 3000 min <sup>-1</sup> 22° ... 42°	Component: Control unit
Program switch "Ω" in setting:	15		
Test equipment: Motortester			Operation: Dwell angle
Scale: Dwell angle		yes	Malfunction: Dwell angle not within tolerance
Connection: Ignition coil		↓	
Operation in vehicle: Have engine run		no	
		Continue testing with next test step.	



- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes

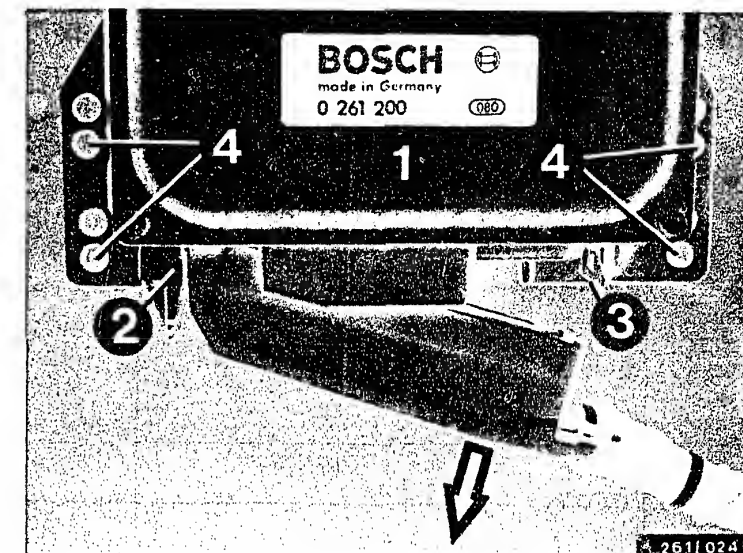
Trouble-shooting:

Take out and replace the control unit.

Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.

TEST STEP 39				
Operation		Reading	Testing	
<u>Program switch "V"</u> <u>in setting:</u>	17	Engine at normal operating temperature. Engine speed 2000 min <sup>-1</sup> . (Keep the same setting for the accelerator pedal.) Press button T5: <u>Engine "hunts,"</u>	<u>Component:</u> Control unit	
<u>Program switch "Ω"</u> <u>in setting:</u>	15			
<u>Test equipment:</u> Motortester		i.e., engine speed drops off and then increases again. (Fuel-injection signal disappear and then reappear at approx. 900 ... 1200 min <sup>-1</sup> .) The fluctuations in engine speed remain as long as <u>button T5 is pressed.</u>	<u>Operation:</u> Cutoff of the fuel-injection signals (overrun cutoff)	
<u>Scale:</u> Engine speed				
<u>Connection:</u> Ignition coil			yes	<u>Malfunction:</u> No cutoff
<u>Operation in vehicle:</u> Have engine run			no	
<u>Button:</u> Press T5		Continue testing with <u>test step 42.</u> (Test steps 40 and 41 are not used.)		



- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes

#### Trouble-shooting:

Take out and replace the control unit.

#### Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.

**G10**

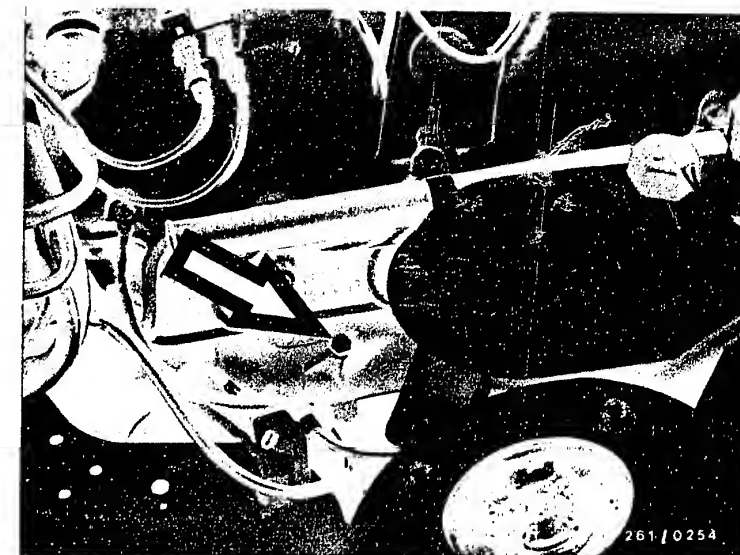
Testing with universal test adapter  
BMW 325e (USA)



**G11**

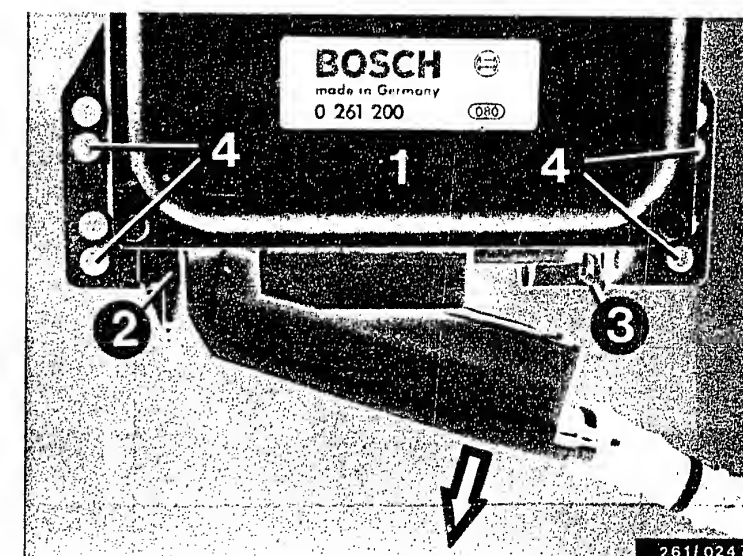
Testing with universal test adapter  
BMW 325e (USA)





Arrow = Co-connection in front of catalytic converter

- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes



Test steps 40 and 41 are not used.			
TEST STEP 42            Disconnect the tank bleeder hose.    Connect the CO-tester in front of the catalytic converter.			
<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
<u>Program switch "V" in setting:</u>	20	<u>CO rises above 3.5 vol. %.</u>  After approx. 10 sec., the CO-level drops back off.	<u>Component:</u> Control unit
<u>Program switch "Ω" in setting:</u>	22		
<u>Test equipment:</u> CO-tester		<div><div>-----</div><div>yes</div><div>↓</div><div>Continue test- ing with <u>next</u> test step.</div></div> <div><div>no</div><div>↓</div></div>	<u>Function:</u> Lambda closed-loop control, upper limit of closed-loop control ("rich" stop), Term. 24 to ground
<u>Scale:</u> 10 vol. %			
<u>Connection:</u> On the test fixture			<u>Malfunction:</u> CO unchanged
<u>Operation in vehicle:</u> Have engine run at normal operating temperature			

#### Trouble-shooting:

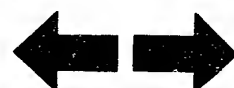
Take out and replace the control unit.

#### Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.

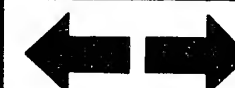
**G 12**

Testing with universal test adapter  
BMW 325e (USA)



**G 13**

Testing with universal test adapter  
BMW 325e (USA)



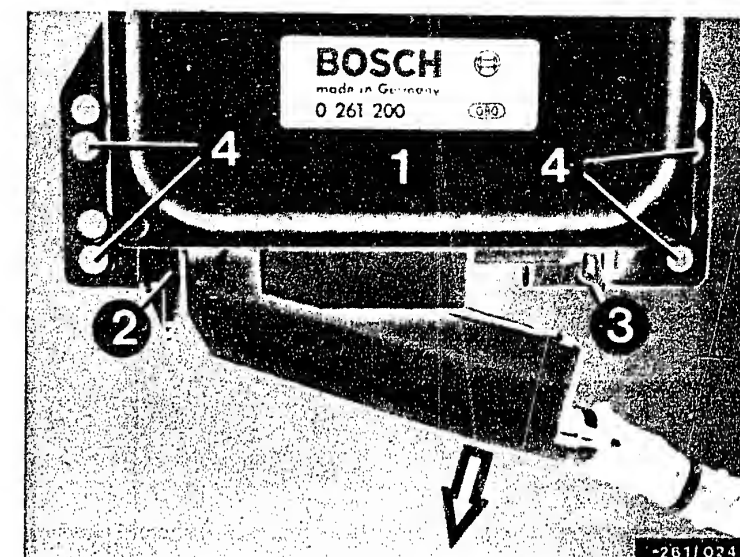
TEST STEP 43			
Operation		Reading	Testing
Program switch "V" in setting:	20	CO drops below 0.5 vol. %.	Component: Control unit
Program switch "Ω" in setting:	23	Engine runs rough. After approx. 10 sec., CO-level rises again.	
Test equipment: Co-tester		<div>yes</div> <div>no</div>	Operation: Lambda closed-loop control, lower limit for closed-loop control ("lean" stop), Term. 24 to + 2 V
Scale: 2.5 vol. %			Malfunction: CO-level unchanged
Connection: On the test fixture			
Operation in vehicle: Have engine run			

#### Trouble-shooting:

Take out and replace the control unit.

#### Note:

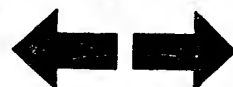
In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.



- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes

**G14**

Testing with universal test adapter  
BMW 325e (USA)



**G15**

Testing with universal test adapter  
BMW 325e (USA)





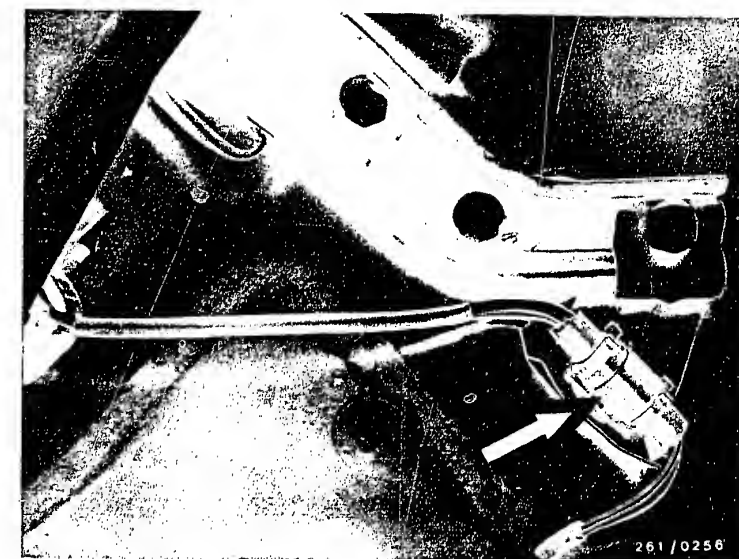
TEST STEP 44			
Operation		Reading	Testing
<u>Program switch "V"</u> <u>in setting:</u>	20	<u>0.5 to 0.8 vol. %</u>  After completion of the test, reconnect the tank bleeder hose.	<u>Component:</u> Lambda sensor
<u>Program switch "Ω"</u> <u>in setting:</u>	24		
<u>Test equipment:</u> CO-tester			<u>Operation:</u> Lambda closed-loop control, Term. 24 connected to lambda sensor.
<u>Scale:</u> 2.5 vol. %			
<u>Connection:</u> On the test fixture			
<u>Operation in vehicle:</u> Have the engine run			<u>Malfunction:</u> CO-level not within tolerance

#### Trouble-shooting:

##### 1. Take out and replace the lambda sensor.

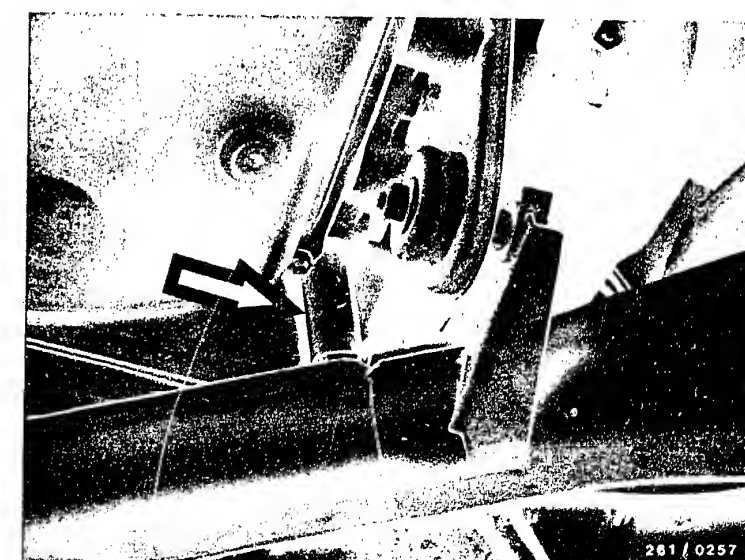
When replacing the sensor, coat its thread with the special mounting paste VS 14016 Ft (5 964 080 105). Make certain that only threads are filled and that no paste gets into the slits. If need be, clean the plug connection for the sensor lead before taking it apart. When plugging back in, do not get any dirt into the plug, and make certain it is properly latched.

##### 2. If 1. is not successful, take out and replace the control unit.



Arrow = Plug connection of lambda sensor

Arrow = Lambda sensor



**G16**

Testing with universal test adapter  
BMW 325e (USA)



**G17**

Testing with universal test adapter  
BMW 325e (USA)





Testing with the universal test adapter has been completed. If the defect has not been found or if additional instructions are needed for correction of the defect, proceed according to the trouble-shooting plan you selected.

Detailed trouble-shooting: ► C3 - C4

Targeted trouble-shooting: ► C5 - C 10



## STARTING MOTOR TURNS, ENGINE DOES NOT START OR STARTS ONLY WITH DIFFICULTY

### Trouble-shooting program according to customer complaint

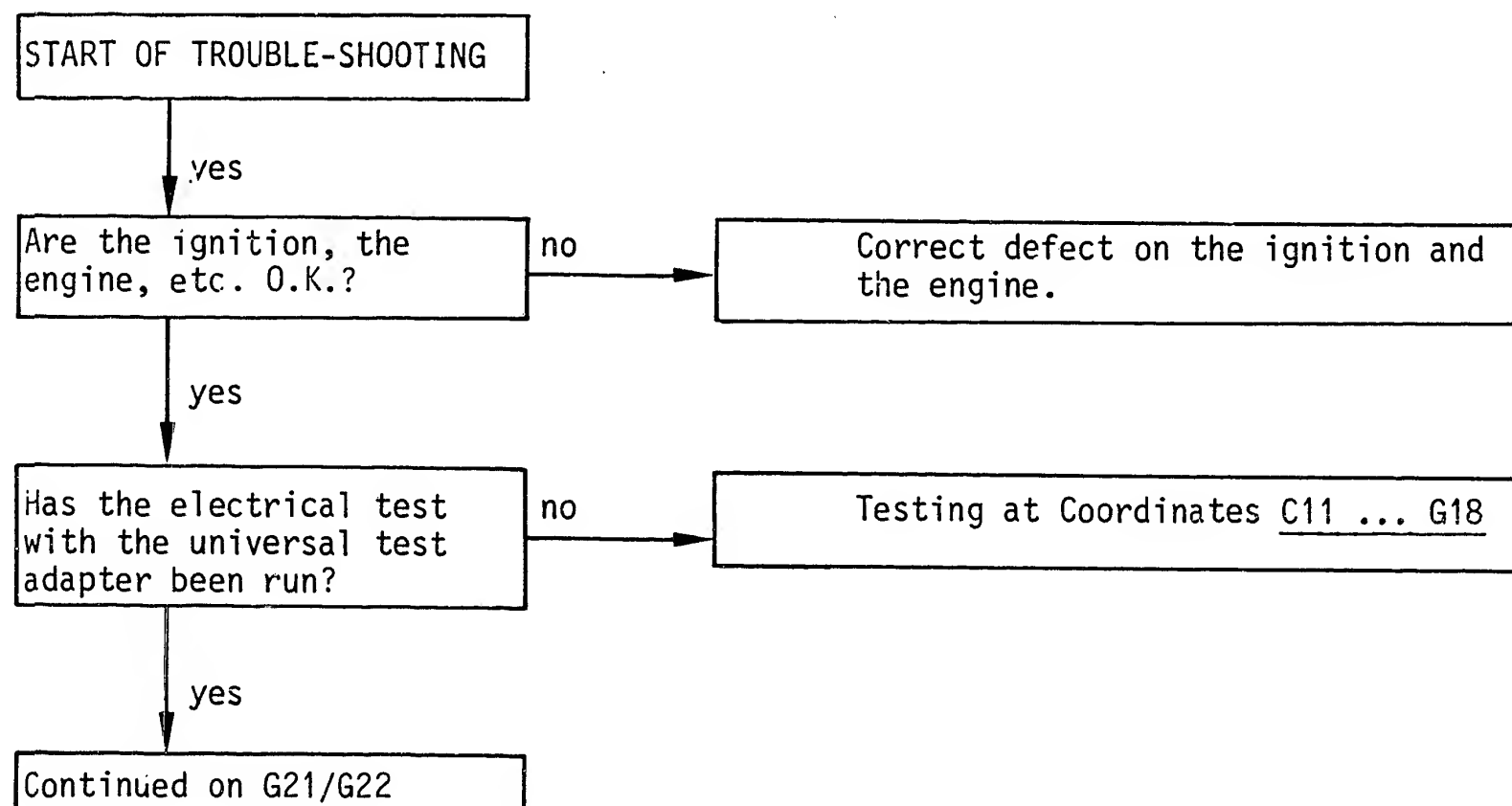
#### How to use the program

Testing is organized into 3 columns of boxes:

- In the column at the left are the questions for the texts being run.
- In the column in the center the component tests and settings are described.
- The column at the right shows the figures belonging to the text and the legend for the figures.

If it is possible to answer the questions clearly with "yes" even without testing, proceed to the next question below.

On the other hand, if the answer to the question is "no", and a defect is suspected, you must switch to the center column of boxes and carry through the tests indicated there. At the end of the test, the trouble shooting is continued at that point at which the shift was made previously.



**G19**

Engine does not start  
BMW 325e (USA)



**G20**

Engine does not start  
BMW 325e (USA)



Starting motor turns, engine does not start or starts only with difficulty (continued)

yes

Check the secondary pattern for all cylinders at starting speed. Is the secondary pattern O.K.?

no

Check the ignition coil and the high voltage portion: is the distributor cap covered with oil on the outside and inside? (Unscrew the distributor rotor and check the camshaft seal).

Notes:

Distributor cap is fastened with 3 screws. To remove the distributor cap the cover of the radiator must be removed. When putting the ignition leads on, watch the cylinder numbers! Do not forget the cover and shielding cap! Check the primary ignition coil for continuity (approx.  $0\Omega$ ). Secondary coil resistance: 5 to  $7.2k\Omega$ .

Check the interference suppression resistors, the ignition leads, and the spark plugs.

Interference suppression resistance in

Ignition distributor rotor:	1 $k\Omega$
Ignition distributor housings: each	1 $k\Omega$
Spark-plug connectors: each	5 $k\Omega$
Spark plugs:	5 $k\Omega$
Ignition coil:	1 $k\Omega$

yes

During the starting process, feel all solenoid-operated fuel-injection valves by hand. Is the movement of the needle perceptible in each of them?

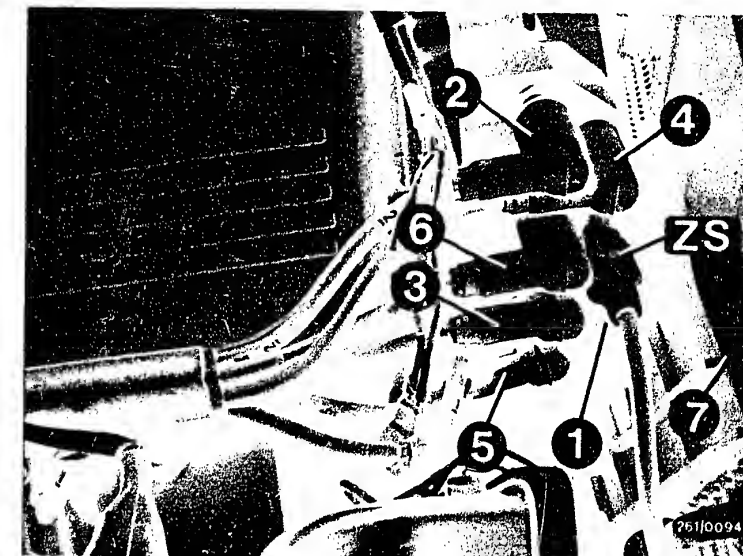
no

Check the solenoid-operated fuel-injection valve with an ohmmeter.  
Test specification: 2 ...  $3\Omega$   
If need be, take up and replace a defective solenoid-operated fuel-injection valve

yes

Continued on H3/H4

Continued on G23/G24



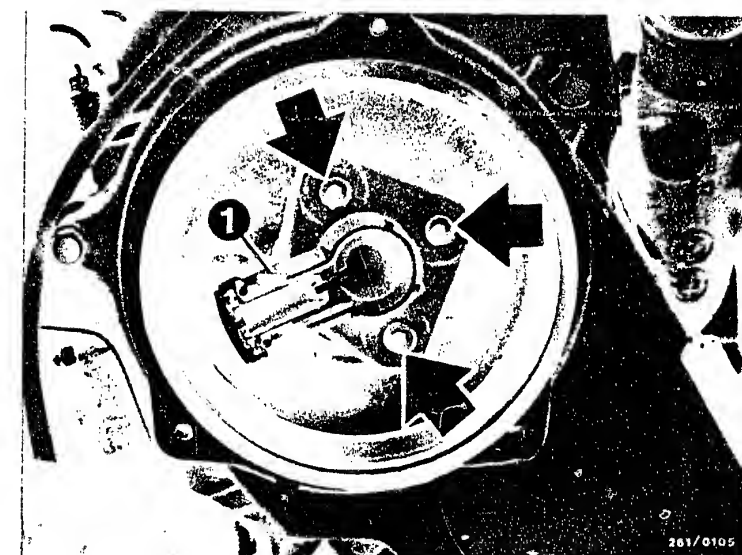
High voltage distributor

1 - 6 = Cylinder numbers

ZS = High voltage lead to the ignition coil

7 = Radiator cover

1 = Distributor rotor  
Arrow = Fastening screws



**G21**

Engine does not start  
BMW 325e (USA)



**G22**

Engine does not start  
BMW 325e (USA)



Starting motor turns, engine does not start or starts only with difficulty (continued)

yes

### Taking out the solenoid-operated fuel-injection valves

Release the fastening screws on the fuel distribution pipe. Pull the fuel distribution pipe up until the solenoid-operated fuel-injection valves are out of the hole in the intake manifold. Do not damage the nozzle needle or the rubber gasket.

Check the nozzle needles and the area around them for tightness of seal and for dirt deposits.

Disconnect the electrical connection.

Carefully shove the holding bracket out of the slot and pull the solenoid-operated fuel-injection valve out of the fuel distribution pipe connection.

### Caution!

Catch any fuel that runs out. Do not allow it to drip on hot portions of the engine. Fire hazard!

### Caution!

The protection sleeve must not be pried off.

### Installation of the solenoid-operated fuel-injection valves.

Take out and replace damaged or swollen O-rings. Use set of parts 1 287 010 704.

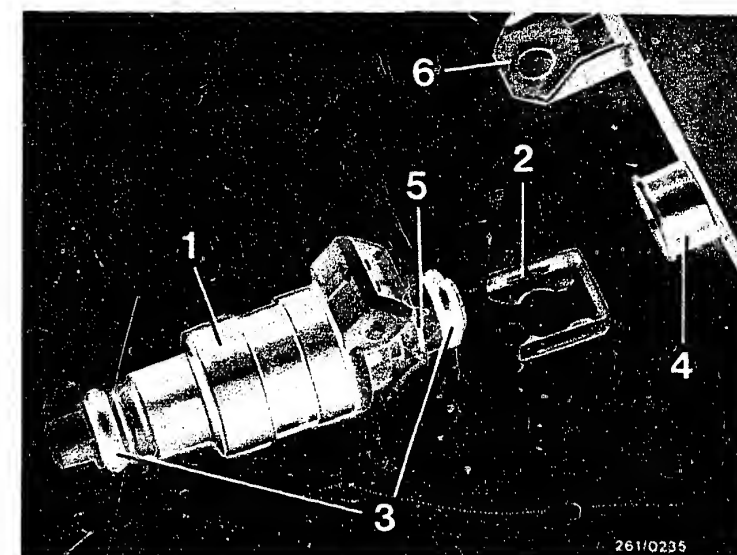
Cut the lower O-ring (intake tube) into pieces.

Caution! Do not damage the protection sleeve.

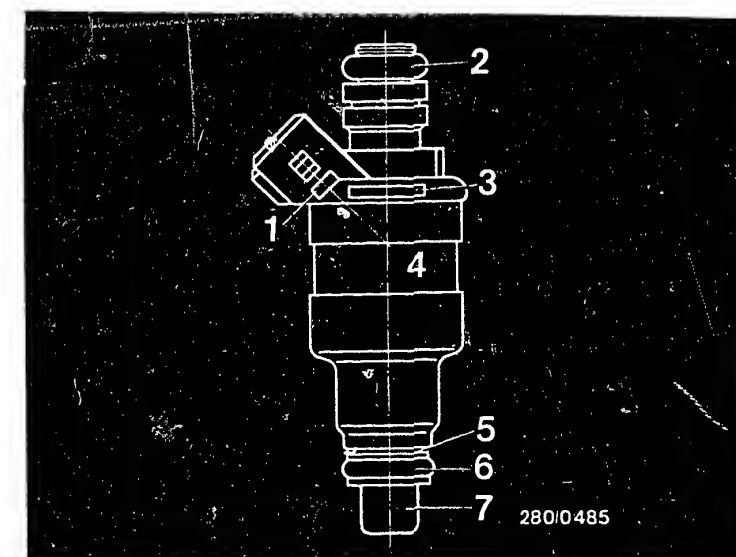
Pull a new O-ring over the protection sleeve and the shoulder on it. Do not damage any parts in so doing.

Continued on H3/H4

Continued on H1/H2

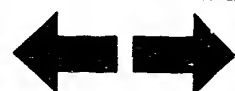


- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab
- 7 = Top O-ring
- 8 = Bottom O-ring
- 9 = Protection sleeve



**G23**

Engine does not start  
BMW 325e (USA)



**G24**

Engine does not start  
BMW 325e (USA)



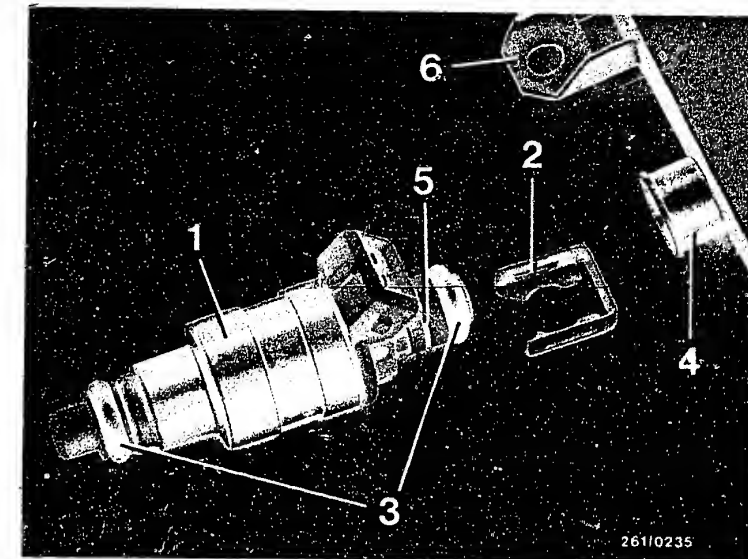
Starting motor turns, engine does not start or starts only with difficulty (continued)

yes

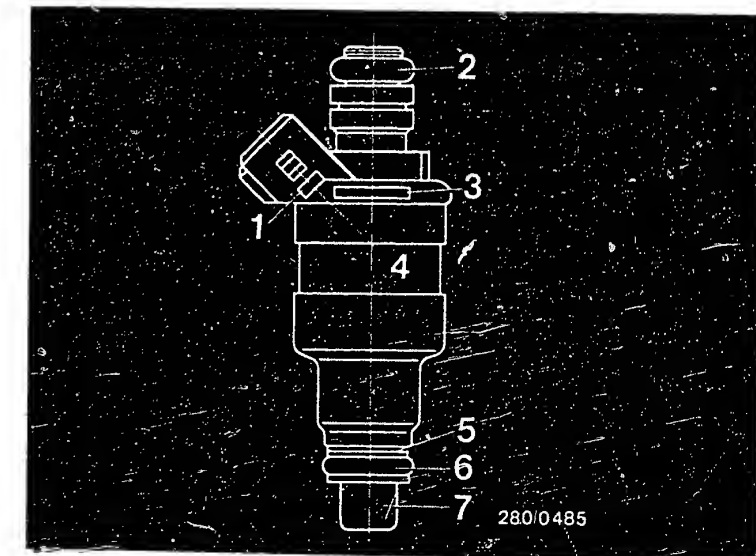
Before installation, check both rubber gaskets for proper seating. Fasten the solenoid-operated fuel-injection valves to the fuel distribution pipe. All solenoid-operated fuel-injection valves are to be pressed into the seats at the same time using the fuel distribution pipe. Screw the fuel distribution pipe tight. Check all air and fuel hoses for proper seating. Make electrical connections.

Start the engine and check that no unmetered air is being drawn in.

Continued on H3/H4



- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab
- 7 = Top O-ring
- 6 = Bottom O-ring
- 7 = Protection sleeve



**H1**

Engine does not start  
BMW 325e (USA)



**H2**

Engine does not start  
BMW 325e (USA)



Starting motor turns, engine does not start or starts only with difficulty (continued)

yes

Is the idle speed control  
(from VDO) O.K.?

no

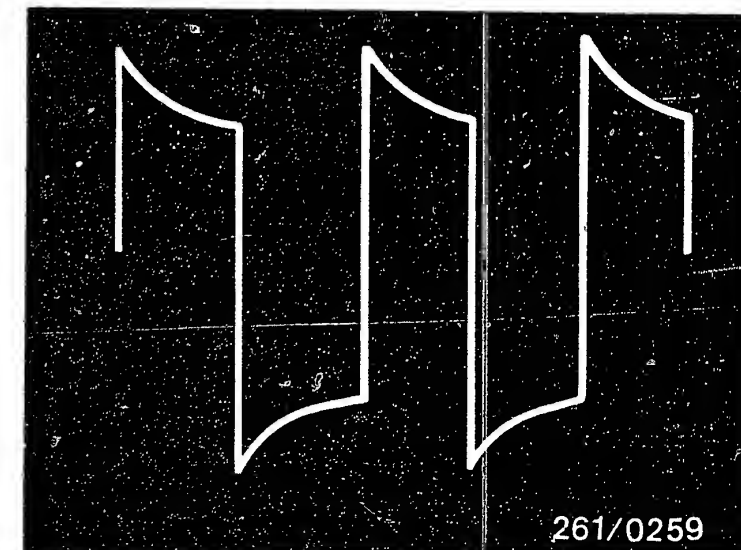
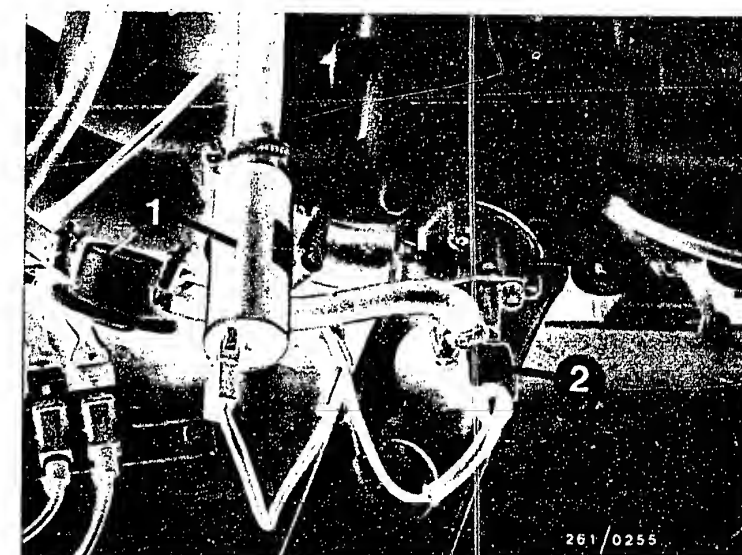
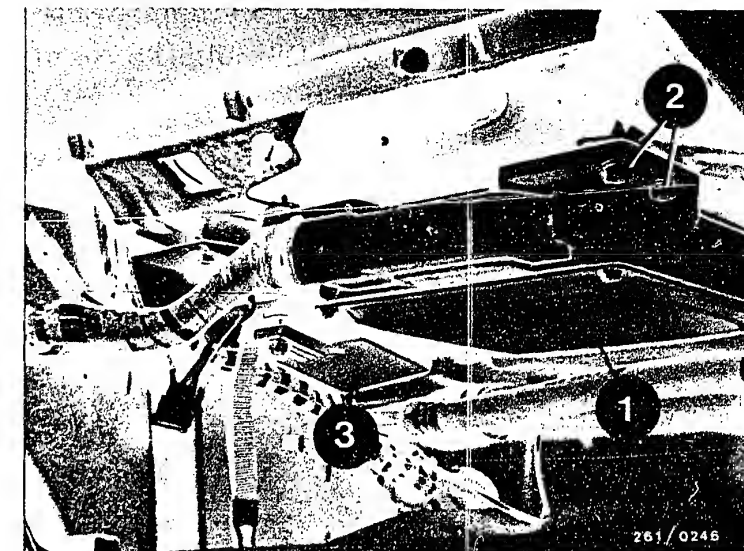
If the engine hunts, take out and replace the idle speed control control unit (Figure at the top - Item 3). Measure the coil resistance of the idle actuator (Figure at the center - Item 1): if there is a break or if the reading is  $0\Omega$ , the actuator is defective.

Measure the pulses on the actuator plug.  
Pulses must be visible on the oscilloscope at idle speed (Figure at the bottom). If there are no pulses: examine the power supply for the idle speed control control unit and/or take out and replace the idle speed control control unit.

Additional cause of defects:  
The actuator is mechanically defective.

yes

Continued on H5/H6



**H3**

Engine does not start  
BMW 325e (USA)



**H4**

Engine does not start  
BMW 325e (USA)





Starting motor turns, engine does not start or starts only with difficulty (continued)

yes

Is the start valve O.K.?

no

Functional test: Check the voltage supply for the start valve at start. To do so, disconnect the plug of the start valve and connect a voltmeter to Term. 73 and Term. 75/Term. 76 of the start valve plug: Reading for voltage min. 6 V, if the coolant temperature is less than  $+30^{\circ}\text{C}$  (with thermotime switch  $35^{\circ} / 8\text{ s}$ ).

Coolant with engine at normal operating temperature (approx.  $+80^{\circ}\text{C}$ ):  
Reading for voltage approx. 0 V.

Check the following leads with an ohmmeter for continuity (specified value approx.  $0\ \Omega$ ):

- Lead from start valve Term. 73 to the thermotime switch Term. W
- Lead from the start valve Term. 75/76 to the thermotime switch Term. G
- Lead from the start valve Term. 75/76 to the starting motor Term. 50

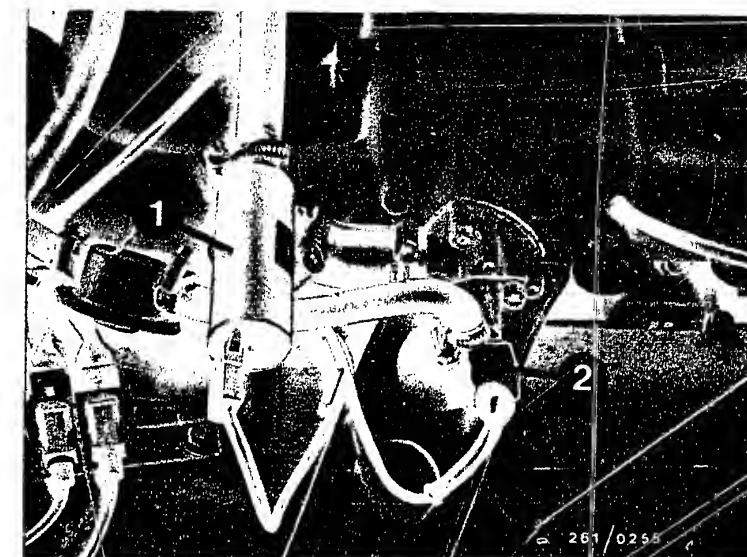
Check the ground connections for the thermotime switch

yes

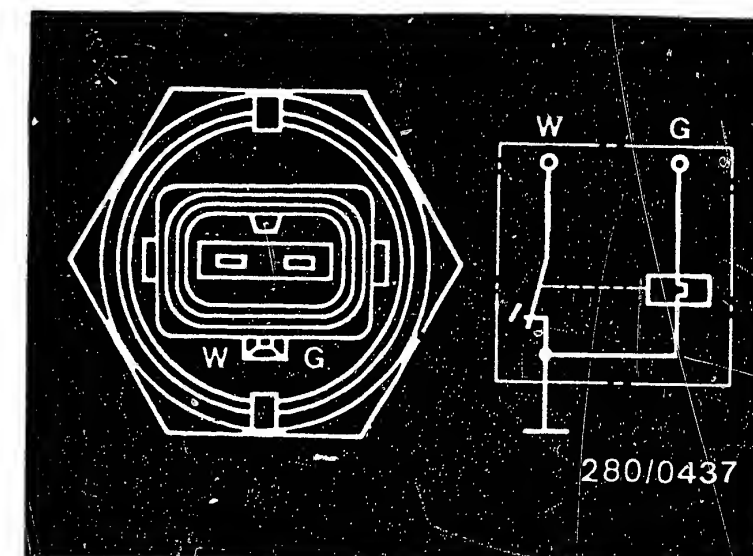
Continued on H11/H12

yes

Continued on H7/H8



1 = Idle actuator  
2 = Start valve



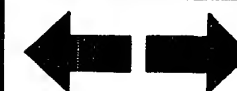
**H5**

Engine does not start  
BMW 325e (USA)



**H6**

Engine does not start  
BMW 325e (USA)



Starting motor turns, engine does not start or starts only with difficulty (continued)

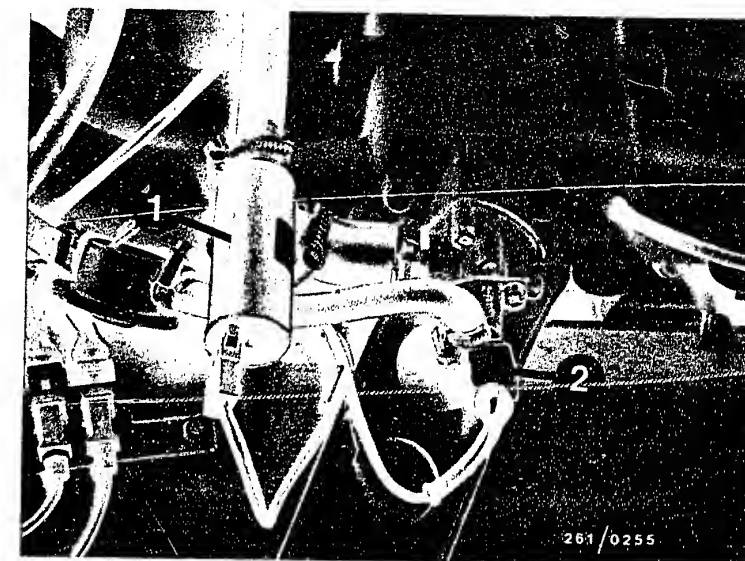
Check the start valve electrically:  
Connect an ohmmeter to the start valve.  
(Disconnect the connecting plug.)  
Specified value approx.  $4\Omega$

Check the start valve mechanically:  
Remove the start valve from the intake pipe and hold it into a container. (Caution: fire hazard!)  
During start, and at temperatures less than  $+30^{\circ}\text{C}$ , the start valve must spray fuel (max. 8 s).  
With the engine at normal operating temperature (approx.  $+80^{\circ}\text{C}$ ), the start valve must not spray fuel. With the ignition switched on, and the pressure built up, it is likewise not permissible for the start valve to spray fuel.

yes

Continued on H11/H12

Continued on H9/H10



1 = Idle actuator  
2 = Start valve

**H7**

Engine does not start  
BMW 325e (USA)



**H8**

Engine does not start  
BMW 325e (USA)



Starting motor turns, engine does not start or starts only with difficulty (continued)

yes

Run the fuel spray test with the engine at normal operating temperature (approx. +80° C) as follows: disconnect the plug from the thermotime switch and ground Term. W.

Check the start valve for leaks:

1. In the engine

Clamp off the fuel delivery line at the start valve. If the engine then runs, take out and replace the start valve.

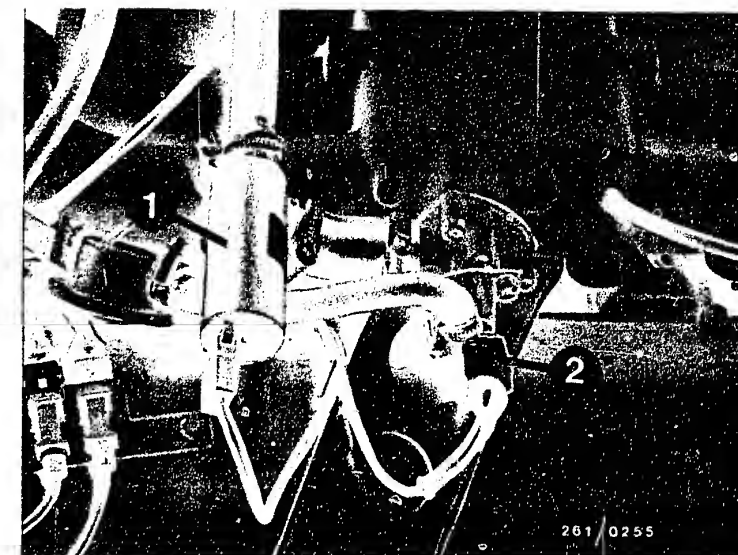
2. Taken out of the engine

Take out the start valve.

(Caution: fire hazard!) The fuel and the electrical lines remain connected. (Place a catch basin under the start valve.) Build up the fuel pressure: on the universal test adaptor, set the program switch "V" at setting 17. Switch ignition on, and press button T3.

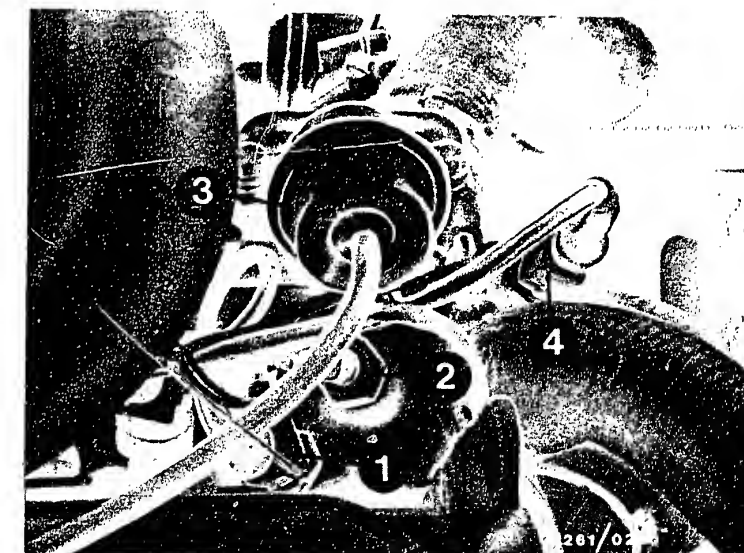
Test specification: the formation of max. 1 drop is permissible at the opening of the valve within one minute.

Continued on H11/H12



1 = Idle actuator  
2 = Start valve

1 = Temperature sensor, engine (NTC II)  
2 = Sensor for remote thermometer  
3 = Pressure regulator  
4 = Thermotime switch



**H9**

Engine does not start  
BMW 325e (USA)



**H10**

Engine does not start  
BMW 325e (USA)



Starting motor turns, engine does not start or starts only with difficulty (continued)

Is the thermotime switch O.K.?

no

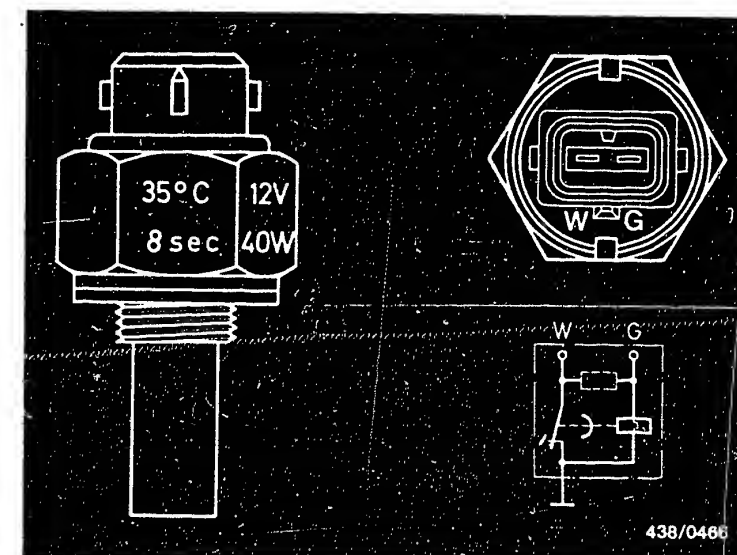
### Electrical test

Check the thermotime switch 35°/8 s as follows: disconnect the plug and measure directly on the thermotime switch using an ohmmeter.

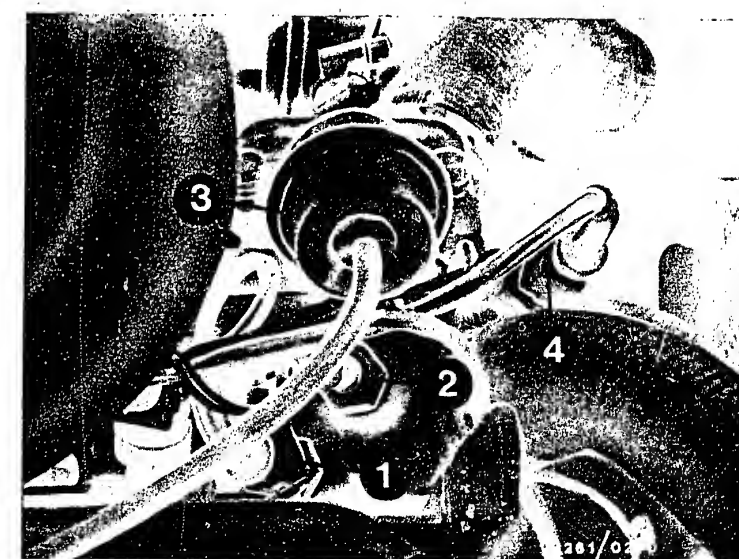
	Between Term. "G" and ground	Between Term. "W" and ground	Between Term. "G" and "W"
Ambient temperature (below +30° C)	25...40 Ω	0Ω	25...40 Ω
Engine at approximately normal operating temperature (above +40° C)	50...80 Ω	100...160Ω	50...80Ω

yes

Continued on H13/H14

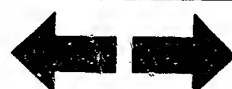


4 = Thermotime switch



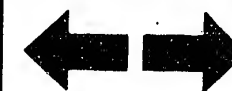
**H11**

Engine does not start  
BMW 325e (USA)



**H12**

Engine does not start  
BMW 325e (USA)



Starting motor turns, engine does not start or starts only with difficulty (continued)

yes  
Is the air-flow sensor  
O.K. mechanically?

no

Testing: Open the air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease as far as the stop, and the flap must close again on its own as far as the stop. The air-flow sensor flap must not stick when opening. Watch for friction markings. If the air-flow sensor is severely fouled inside, clean it, and rub it out with a lint-free cloth. If there are friction markings present, the air-flow sensor must be taken out and replaced.

yes

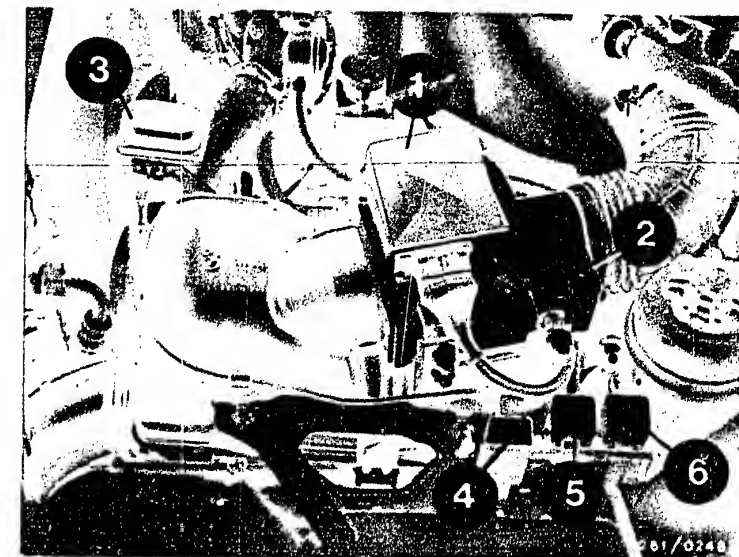
Are all the hose lines  
and electrical lead  
connections put on  
correctly? Visual  
inspection. Has the  
intake system been  
checked for leaks?

no

Check that the hoses on the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace the hoses. Eliminate leaks by using new gaskets or by tightening the connecting screws. Testing for leaks: Seal off the exhaust pipe and the air inlet point on the air filter. Disconnect the hose between the air-flow sensor and the idle actuator at the air-flow sensor. Seal off the hose opening to the idle actuator and using a compressed air gun (0.3 gauge pressure), blow into the intake manifold. In so doing, open the throttle valve fully. Brush or spray soapy water on all joints after the air-flow sensor flap. Bubbling or foaming indicates leaks. Check electrical plug contacts for loose contacts.

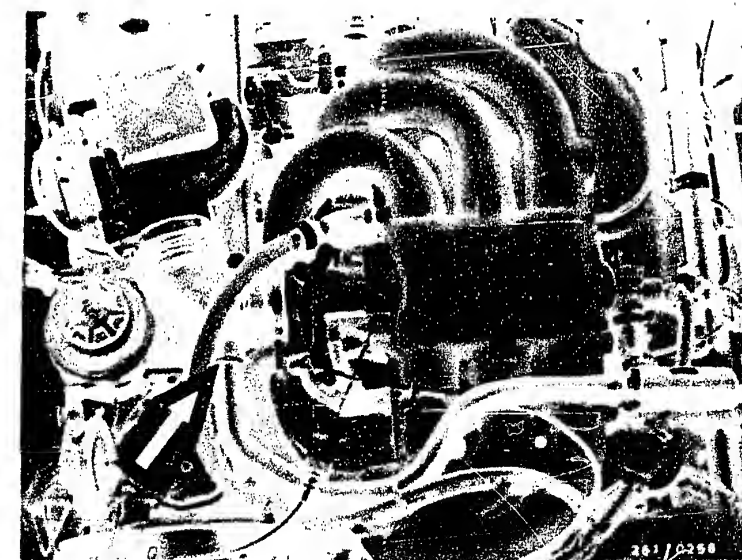
yes

Continued on H15/H16



1 = Air-flow sensor with NTC I  
2 = Idle-mixture-adjusting screw

Arrow = Disconnect hose here for  
leak test.



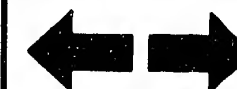
**H13**

Engine does not start  
BMW 325e (USA)



**H14**

Engine does not start  
BMW 325e (USA)





Starting motor turns, engine does not start or starts only with difficulty (continued)

yes

Checking the customer complaint  
"Starting motor turns, engine does not or starts only with difficulty,"

has been completed.  
Has the customer complaint been corrected?

no

Additional possible defects

- The customer complaint has been incorrectly identified. (See Coordinates C3 ... C10). If the defect has not been identified using the "Targeted Trouble-Shooting", see "Detailed Trouble-Shooting" (Coordinates C3/C4).
- Engine is not O.K. mechanically. (Compression, valve setting, valve timing, wear on camshaft).

**H15**

Engine does not start  
BMW 325e (USA)



**H16**

Engine does not start  
BMW 325e (USA)



## ENGINE STARTS AND THEN DIES

### Trouble-shooting program according to customer complaint

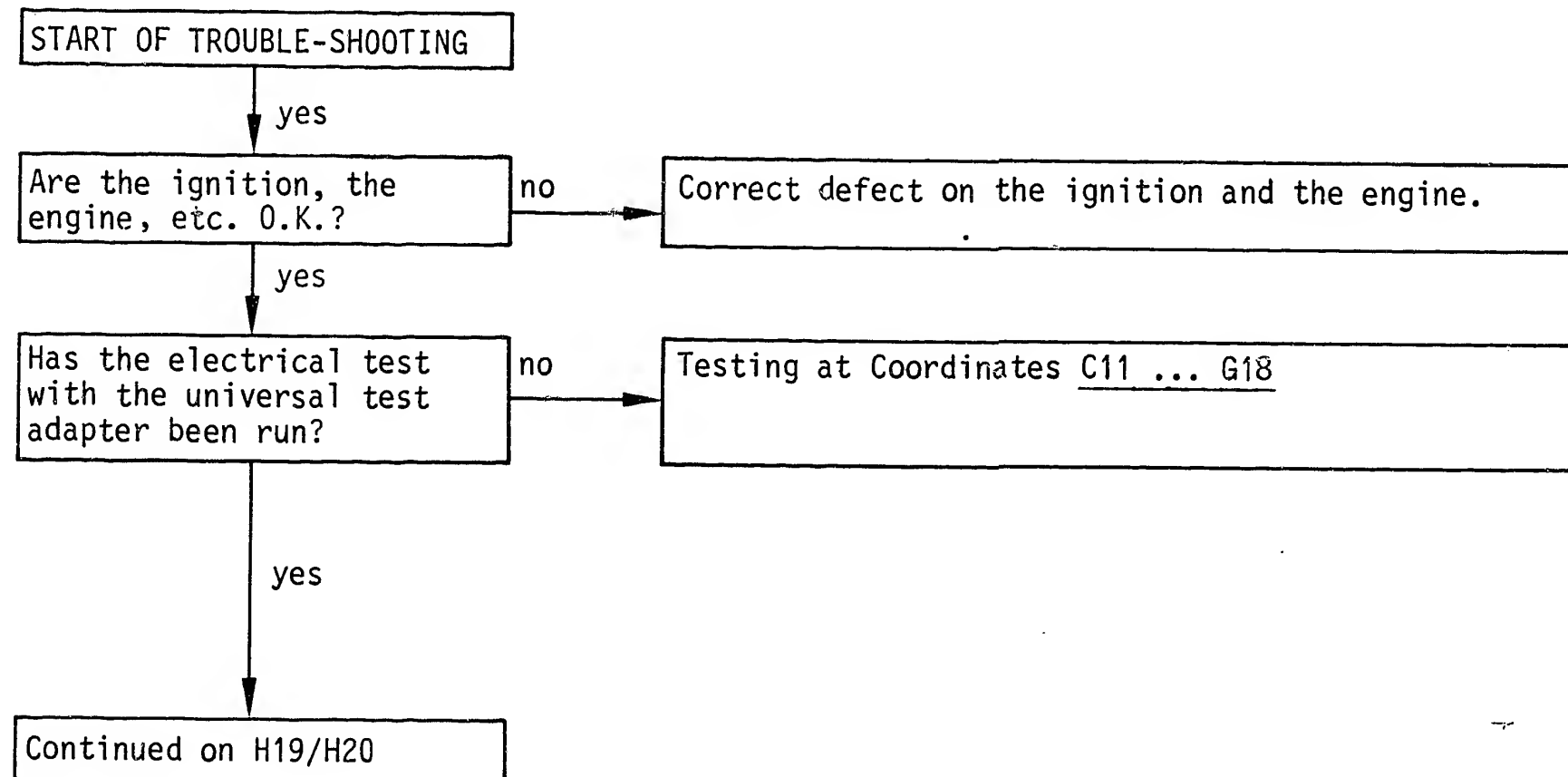
#### How to use the program

Testing is organized into 3 columns of boxes:

- In the column at the left are the questions for the tests being run.
- In the column in the center the component tests and settings are described.
- The column at the right shows the figures belonging to the text and the legend for the figures.

If it is possible to answer the questions clearly with "yes" even without testing, proceed to the next question below.

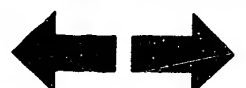
On the other hand, if the answer to the question is "no", and a defect is suspected, you must switch to the center column of boxes and carry through the tests indicated there. At the end of the test, the trouble-shooting is continued at that point at which the shift was made previously.

**H17**

Engine starts and then dies  
BMW 325e (USA)

**H18**

Engine starts and then dies  
BMW 325e (USA)



Engine starts and then dies (continued)

yes

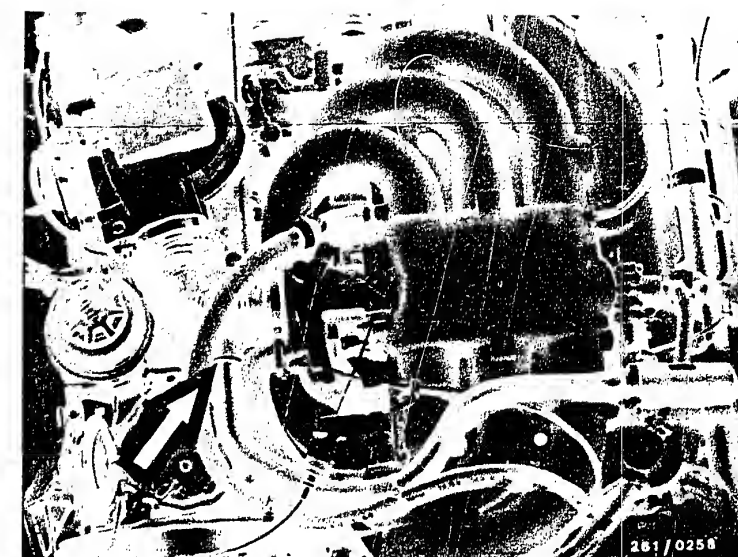
Are all the hose lines and electrical lead connections put on correctly? Visual inspection. Has the intake system been checked for leaks?

no

Check that the hoses on the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace the hoses. Eliminate leaks by using new gaskets or by tightening the connecting screws. Testing for leaks: Seal off the exhaust pipe and the air inlet point on the air filter. Disconnect the hose between the air-flow sensor and the idle actuator at the air-flow sensor. Seal off the hose opening to the idle actuator and using a compressed air gun (0.3 bar gauge pressure), blow into the intake manifold. In doing so, open the throttle valve fully. Brush or spray soapy water on all joints after the air-flow sensor flap. Bubbling or foaming indicates leaks. Check electrical plug contacts for loose contacts.

yes

Continued on H21/H22



Arrow = Disconnect hose here for leak test.

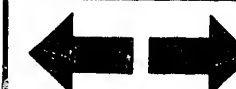
**H19**

Engine starts then dies  
BMW 325e (USA)



**H20**

Engine starts then dies  
BMW 325e (USA)



Engine starts and then dies (continued)

yes

Is the idle speed control  
(from VDO) O.K.?

no

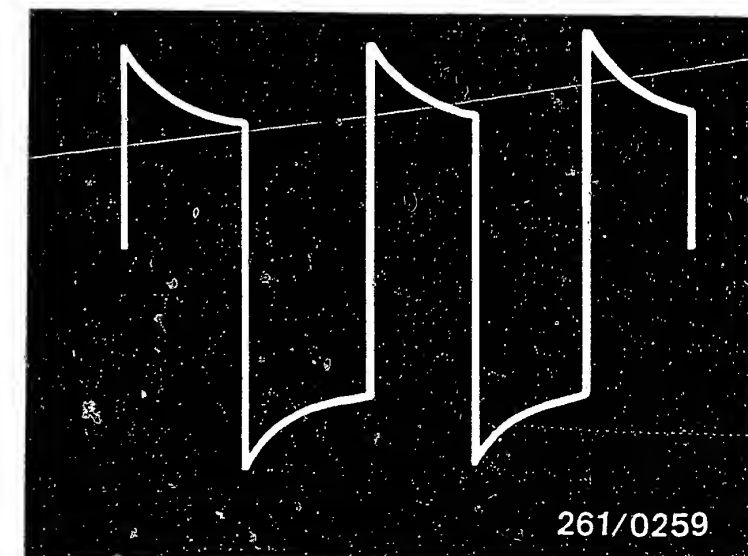
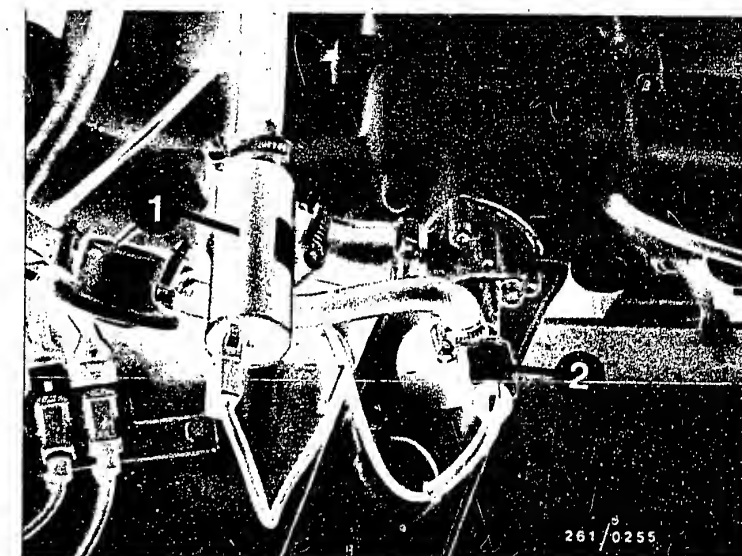
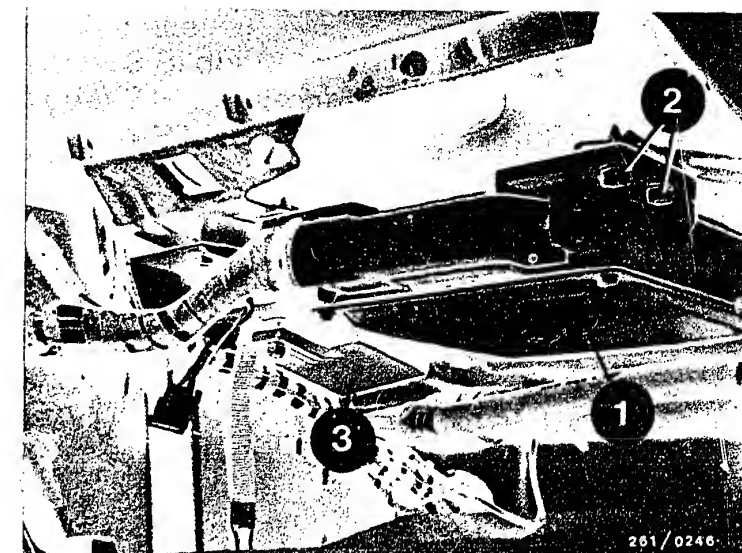
If the engine hunts, take out and replace the idle speed control control unit (Figure at the top - Item 3). Measure the coil resistance of the idle actuator (Figure at center - Item 1): if there is a break or if the reading is  $0\ \Omega$ , the actuator is defective.

Measure the pulses on the actuator plug. Pulses must be visible on the oscilloscope at idle speed (Figure at the bottom). If there are no pulses: examine the power supply for the idle speed control control unit and/or take out and replace the idle speed control control unit.

Additional cause of defects:  
The actuator is mechanically defective.

yes

Continued on H23/H24



**H21**

Engine starts and then dies  
BMW 325e (USA)



**H22**

Engine starts and then dies  
BMW 325e (USA)



Engine starts and then dies (continued)

yes

Is the start valve O.K.?

no

Check the start valve for leaks:

1. In the engine

Clamp off the fuel delivery line at the start valve. If the engine then runs smooth, take out and replace the start valve.

2. Taken out of the engine

Take out the start valve.

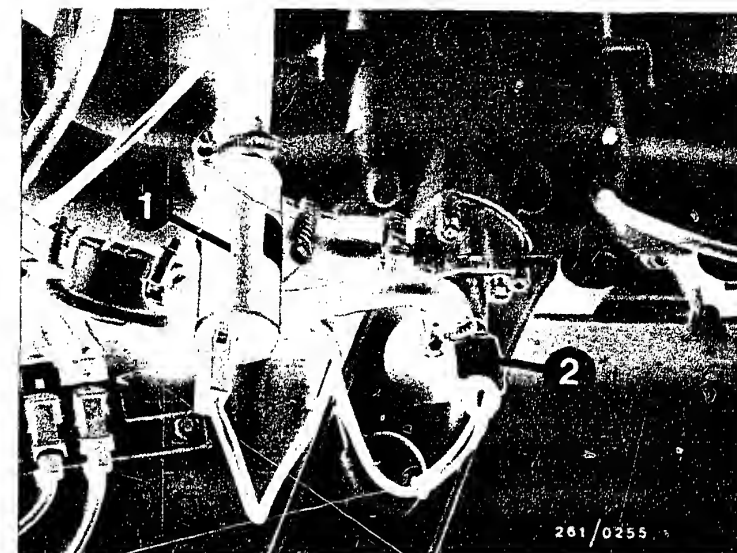
(Caution: fire hazard!) The fuel and the electrical lines remain connected. (Place a catch basin under the start valve.)

Build up the fuel pressure: on the universal test adapter, set the program switch "V" at setting 17. Switch ignition on, and press button T3.

Test specification: the formation of max. 1 drop is permissible at the opening of the valve within one minute.

yes

Continued on J1/J2



1 = Idle actuator

2 = Start valve

**H23**

Engine starts and then dies  
BMW 325e (USA)

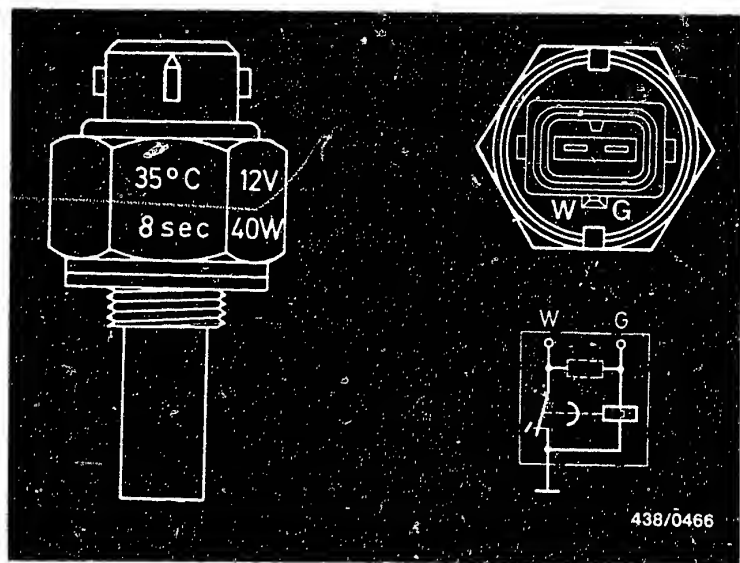
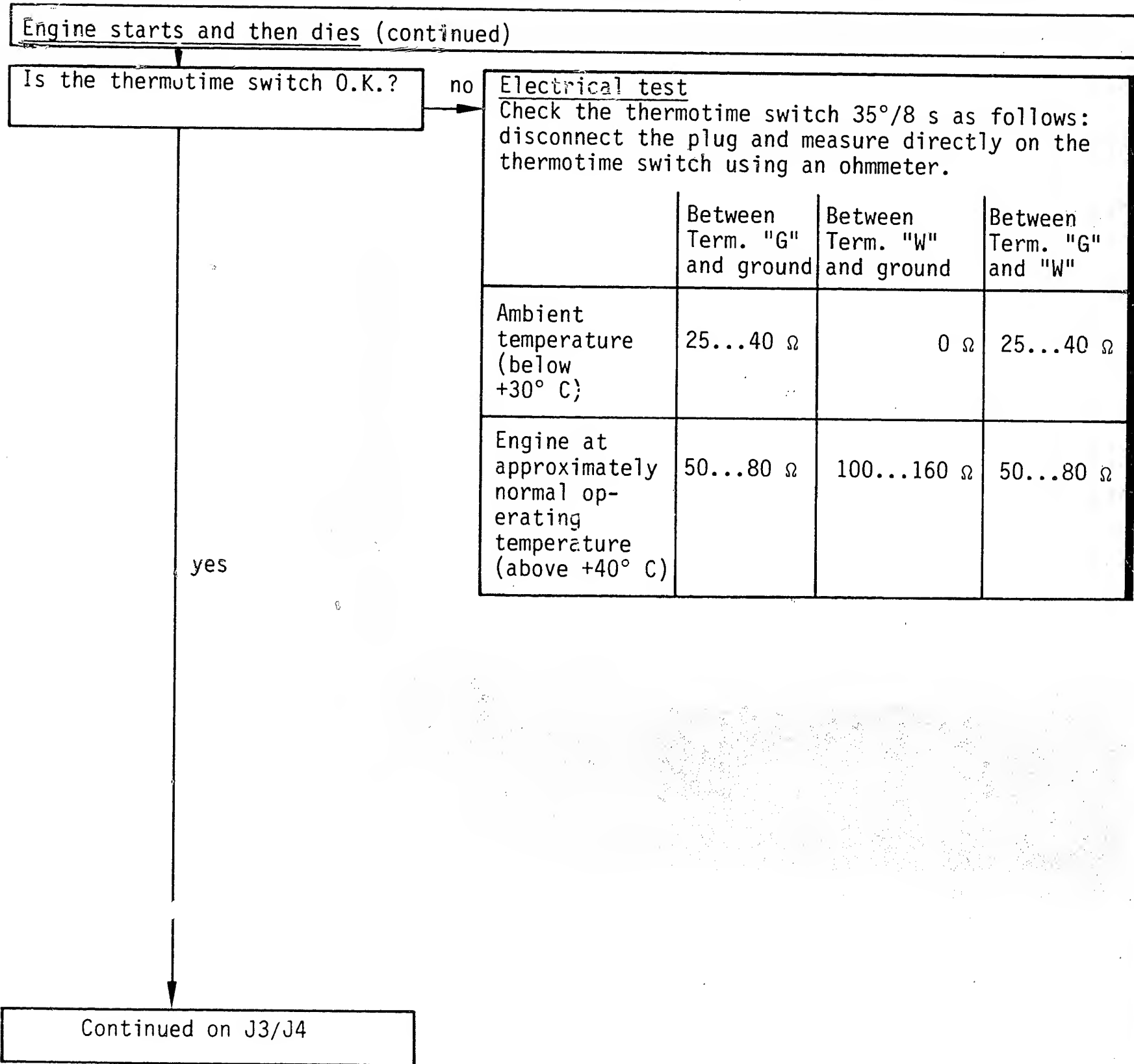


**H24**

Engine starts and then dies  
BMW 325e (USA)

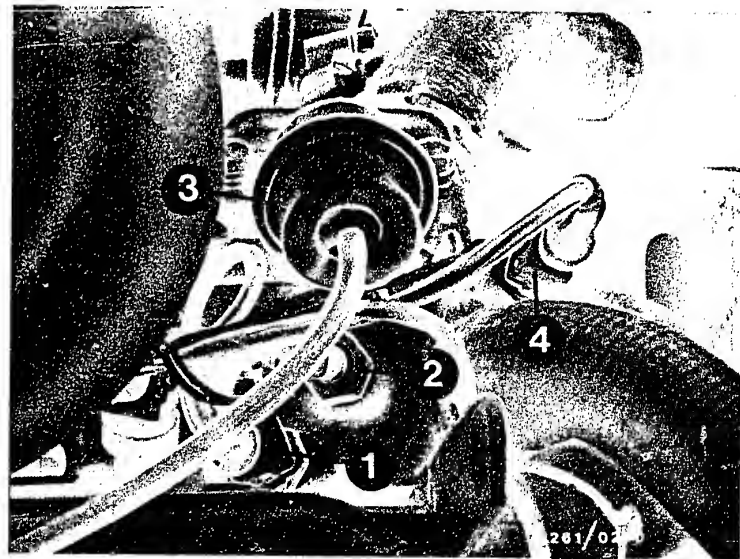


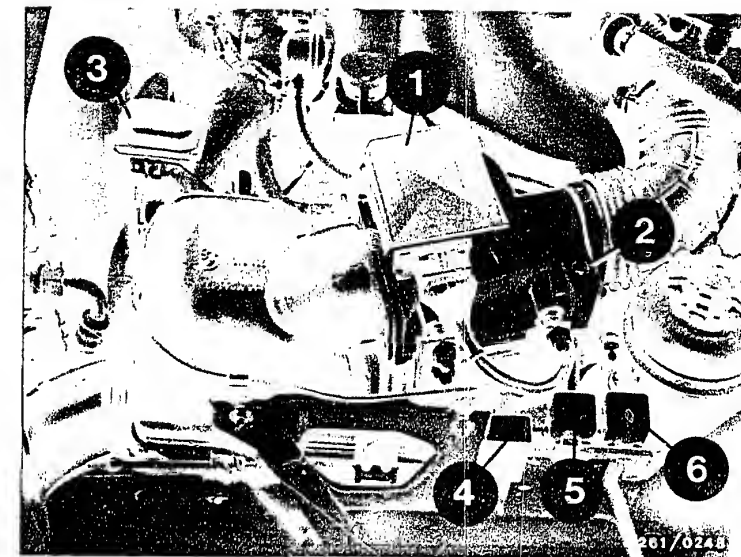
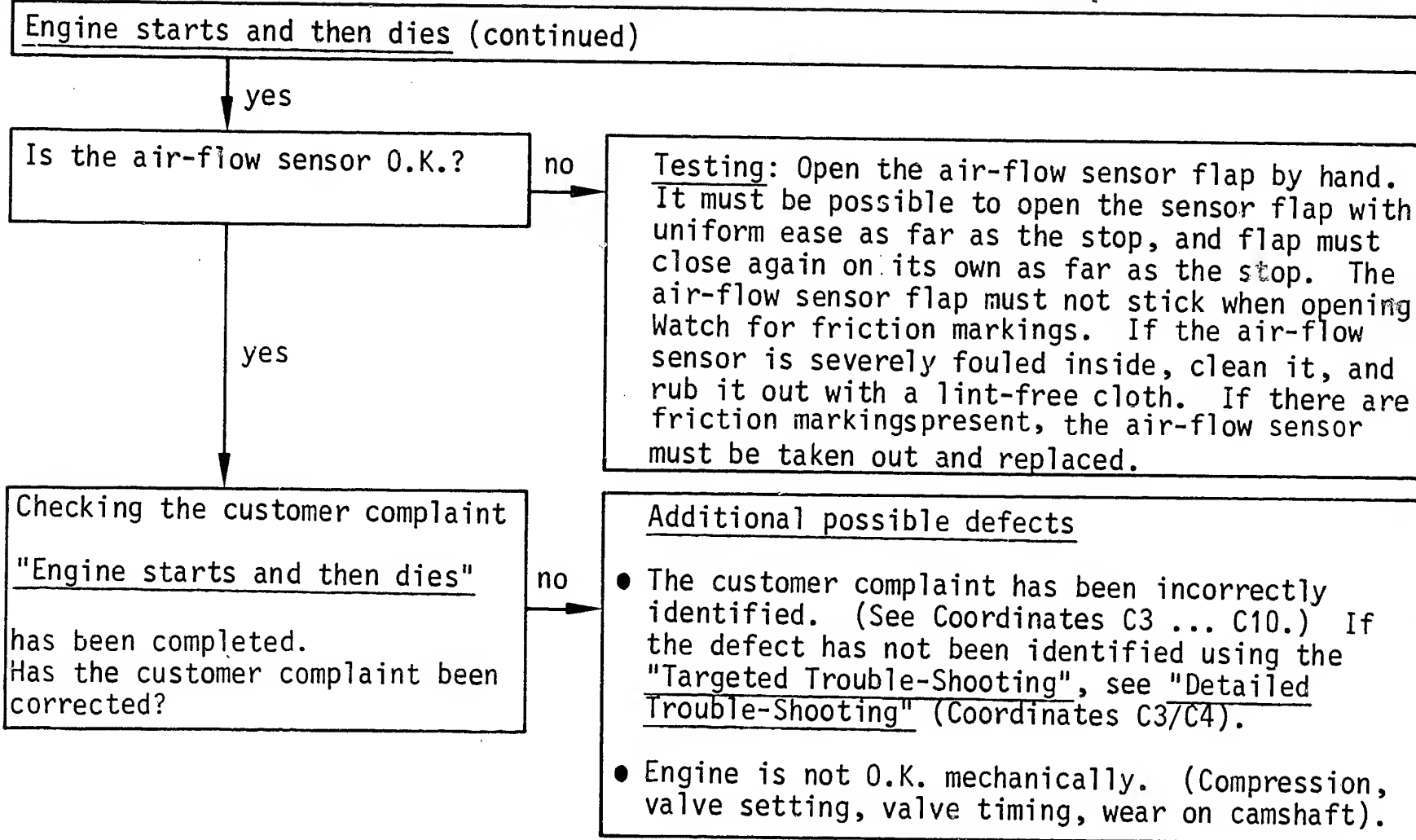




Thermotime switch  
35° C / 8 s.

4 = Thermotime switch





1 = Air-flow sensor with NTC I  
2 = Idle-mixture-adjusting screw

**J3**

Engine starts and then dies  
BMW 325e (USA)



**J4**

Engine starts and then dies  
BMW 325e (USA)



## ROUGH IDLE, AND/OR INCORRECT IDLE SPEED

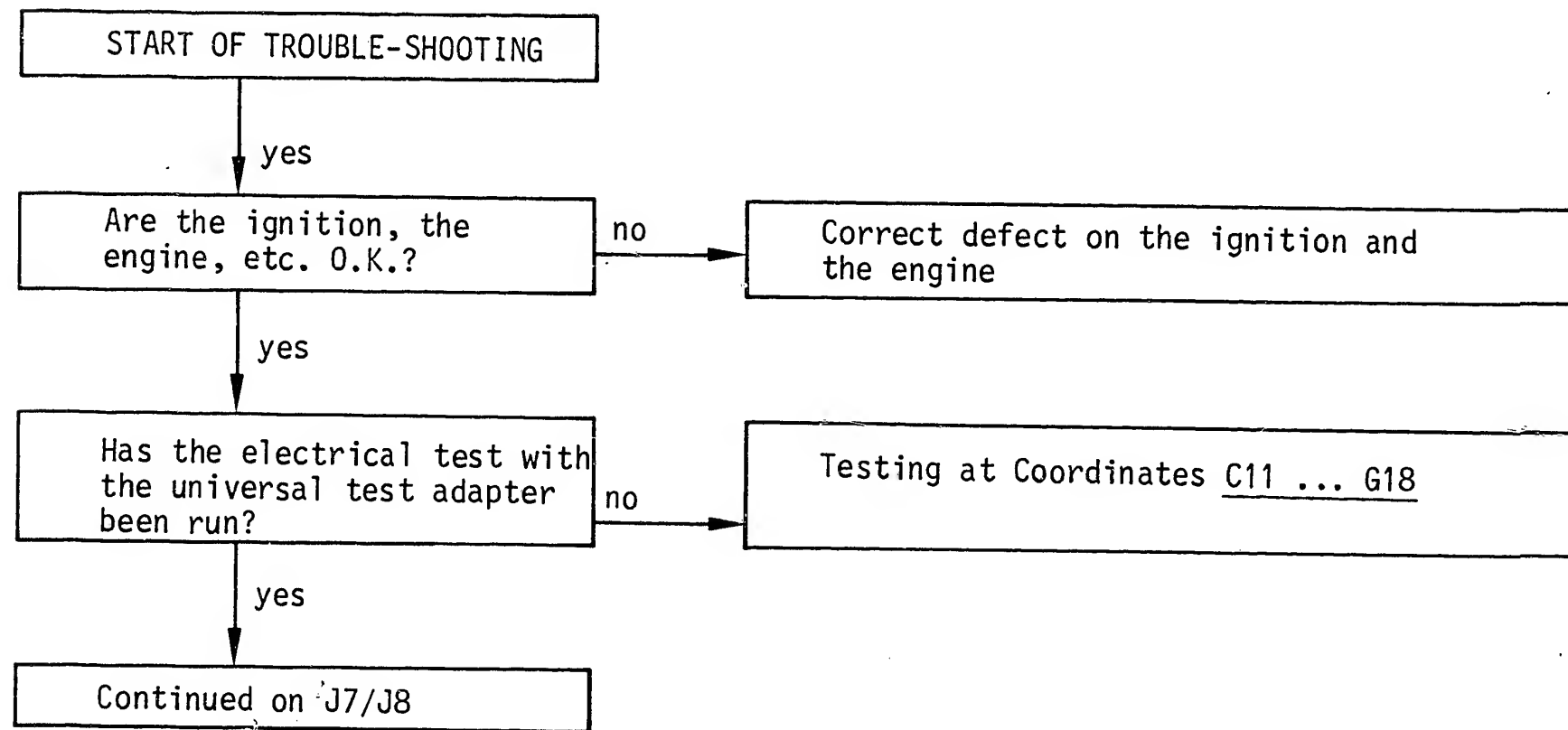
Trouble-shooting program according to customer complaint

How to use the program

Testing is organized into 3 columns of boxes:

- In the column at the left are the questions for the tests being run.
- In the column in the center the component tests and settings are described.
- The column at the right shows the figures belonging to the text and the legend for the figures.

If it is possible to answer the questions clearly with "yes" even without testing, proceed to the next question below.  
On the other hand, if the answer to the question is "no", and a defect is suspected, you must switch to the center column of boxes and carry through the tests indicated there. At the end of the test, the trouble-shooting is continued at that point at which the shift was made previously.



**J5**

Rough idle  
BMW 325e (USA)



**J6**

Rough idle  
BMW 325e (USA)



# Rough idle and/or incorrect idle speed (continued)

yes

Check the secondary pattern for all cylinders.  
Is the secondary pattern O.K.?

no

Check the ignition coil and the high voltage portion: is the distributor cap covered with oil on the outside and inside? (Unscrew the distributor rotor and check the camshaft seal.)

Notes:

Distributor cap is fastened with 3 screws. To remove the distributor cap the cover of the radiator must be removed. When putting the ignition leads on, watch the cylinder number! Do not forget the cover and shielding cap! Check the primary ignition coil for continuity (approx.  $0\Omega$ ).

Secondary coil resistance: 5 to 7.2 k $\Omega$ . Check the interference suppression resistors, the ignition leads, and the spark plugs.

Interference-suppression resistance in

Ignition distributor rotor:	1 k $\Omega$
Ignition distributor housings: each	1 k $\Omega$
Spark-plug connectors: each	5 k $\Omega$
Spark plugs:	5 k $\Omega$
Ignition coil:	1 k $\Omega$

yes

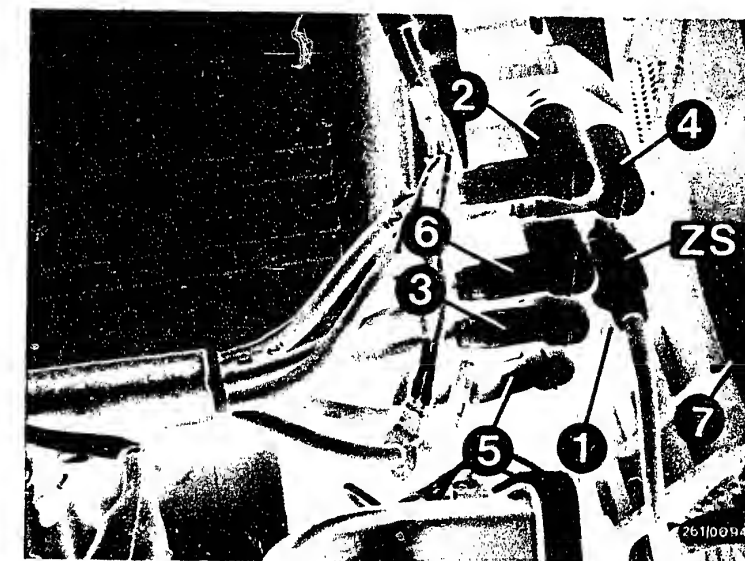
Is the air-flow sensor O.K.?

no

Testing: Open the air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease as far as the stop, and the flap must close again on its own as far as the stop. The air-flow sensor flap must not stick when opening. Watch for friction markings. If the air-flow sensor is severely fouled inside, clean it, and rub it out with a lint-free cloth. If there are friction markings present, the air-flow sensor must be taken out and replaced.

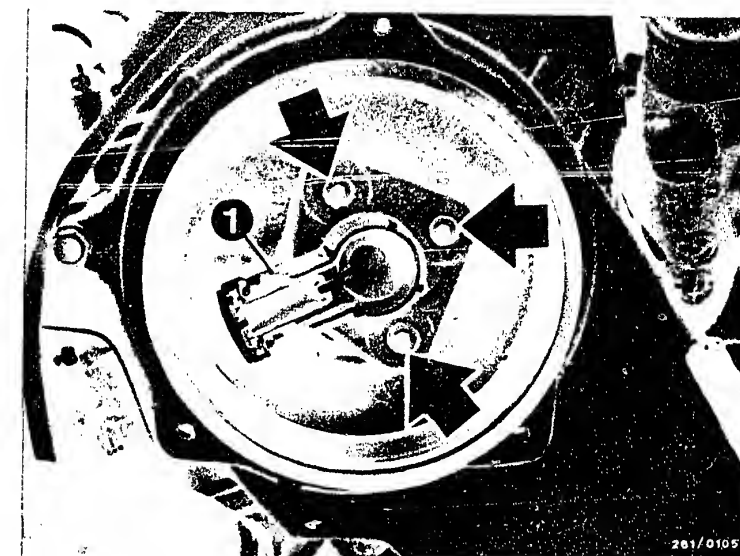
yes

Continued on J9/J10



High voltage distributor  
1 - 6 = Cylinder numbers  
ZS = High voltage lead to the ignition coil  
7 = Radiator cover

1 = Distributor rotor  
Arrow = Fastening screws



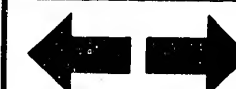
J7

Rough idle  
BMW 325e (USA)



J8

Rough idle  
BMW 325e (USA)



Rough idle and/or incorrect idle speed (continued)

yes

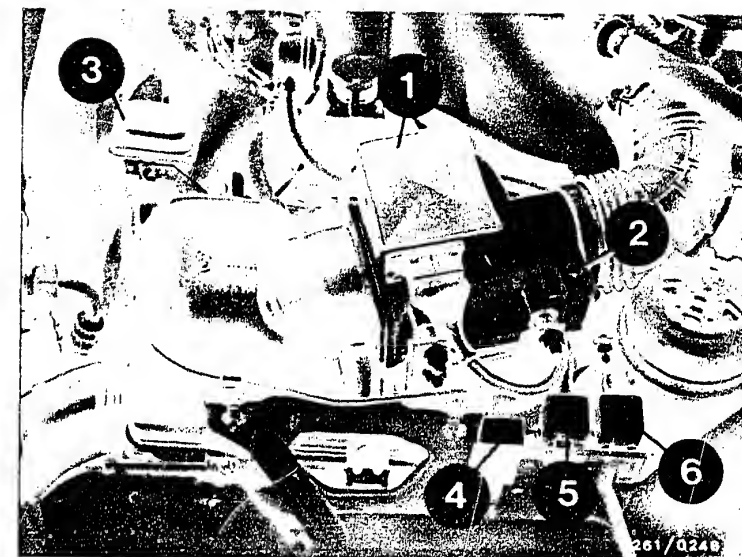
Are all the hose lines and electrical lead connections put on correctly? Visual inspection. Has the intake system been checked for leaks?

no

Check that the hoses on the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace the hoses. Eliminate leaks by using new gaskets or by tightening the connecting screws. Testing for leaks: Seal off the exhaust pipe and the air inlet point on the air filter. Disconnect the hose between the air-flow sensor and the idle actuator at the air-flow sensor. Seal off the hose opening to the idle actuator and using a compressed air gun (0.3 bar gauge pressure), blow into the intake manifold. In so doing, open the throttle valve fully. Brush or spray soapy water on all joints after the air-flow sensor flap. Bubbling or foaming indicates leaks. Check electrical plug contacts for loose contacts.

yes

Continued on J11/J12



- 1 = Air-flow sensor with NTC I  
2 = Idle-mixture-adjusting screw

**J9**

Rough idle  
BMW 325e (USA)



**J10**

Rough idle  
BMW 325e (USA)





# Rough idle and/or incorrect idle speed (continued)

yes

Is the idle speed control (from VDO) O.K.?

no

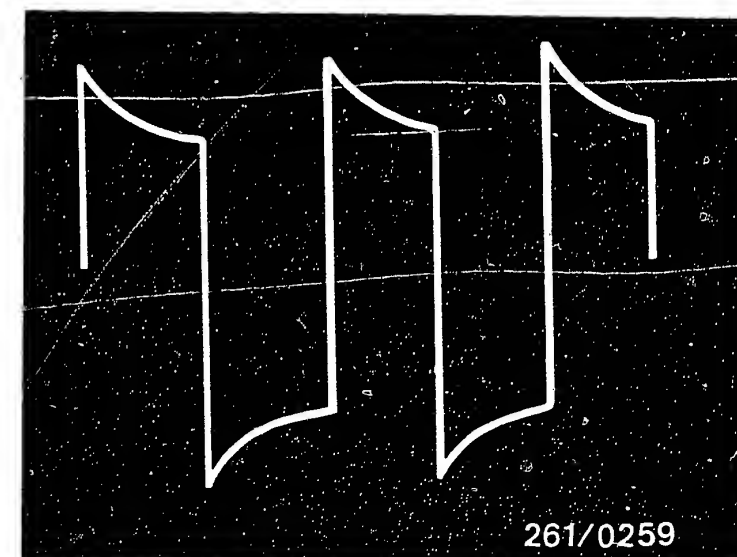
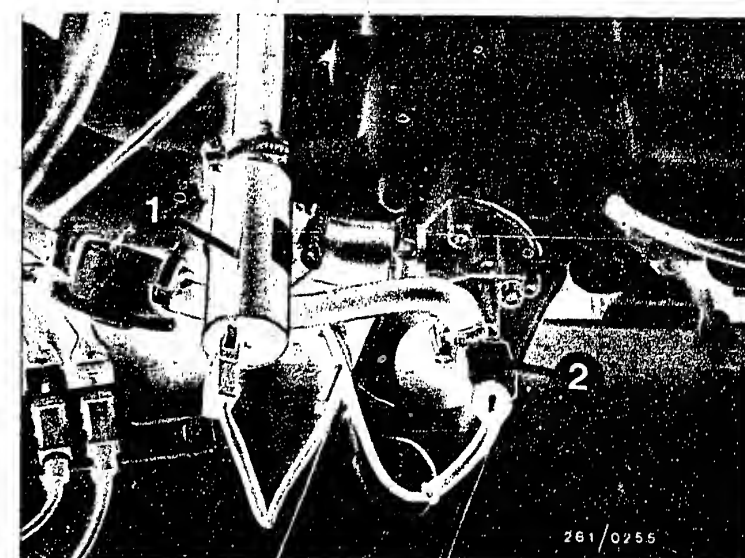
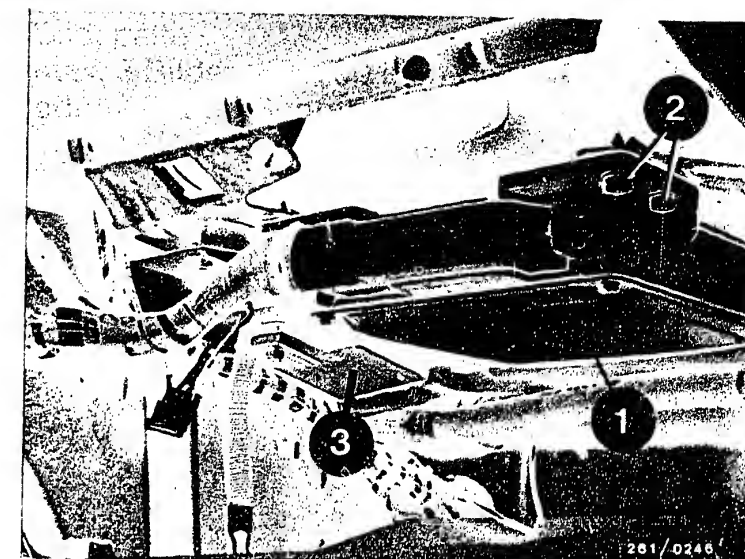
If the engine hunts, take out and replace the idle speed control control unit (Figure at the top - Item 3). Measure the coil resistance of the idle actuator (Figure at the center - Item 1): if there is a break or if the reading is 0  $\Omega$ , the actuator is defective.

Measure the pulses on the actuator plug. Pulses must be visible on the oscilloscope at idle speed (Figure at the bottom). If there are no pulses: examine the power supply for the idle speed control control unit and/or take out and replace the idle speed control control unit.

Additional cause of defects:  
The actuator is mechanically defective.

yes

Continued on J13/J14



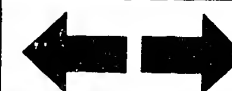
J11

Rough idle  
BMW 325e (USA)



J12

Rough idle  
BMW 325e (USA)



# Rough idle and/or incorrect idle speed (continued)

Is the thermotime switch O.K.?

no

## Electrical test:

Check the thermotime switch 35° C/8 s as follows:  
disconnect the plug and measure directly on the thermotime switch using an ohmmeter.

1. Between Term. "G" and ground at ambient temperature (less than +30° C):  
25 ... 40Ω. With engine at approximately normal operating temperature (above +40° C): 50 ... 80Ω.
2. Between Term. "W" and ground at ambient temperature (less than +30° C):  
0Ω. With engine at approximately normal operating temperature (above 40° C): 100 ... 160Ω
3. Between Term. "G" and "W" at ambient temperature (less than +30° C): 25 ... 40Ω.  
With engine at approximately normal operating temperature (above 40° C): 50 ... 80Ω

yes

Is the start valve O.K.?  
(Leak test)

no

## Check the start valve for leaks:

### 1. In the engine

Clamp off the fuel delivery line at the start valve.  
If the engine then runs smooth, take out and replace the start valve.

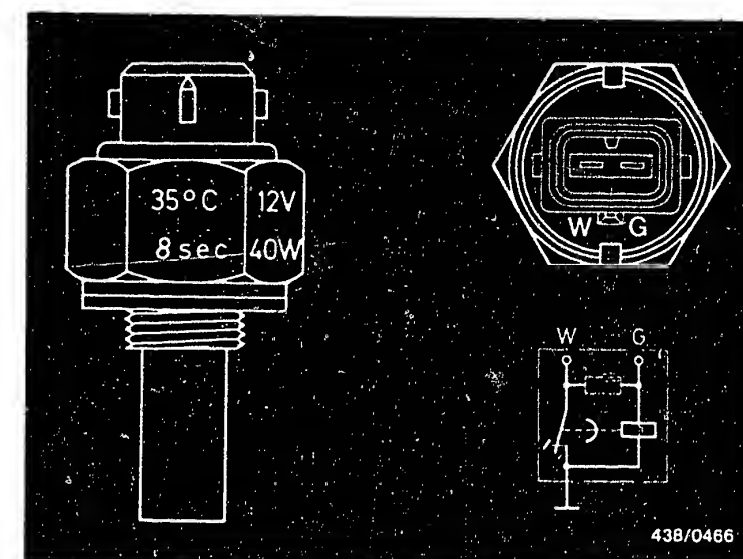
### 2. Taken out of the engine

Take out the start valve. (Caution: fire hazard!)  
The fuel and the electrical lines remain connected.  
(Place a catch basin under the start valve.)  
Build up the fuel pressure: on the universal test adapter, set the program switch "V" at setting 17.  
Switch ignition on, and press button T3.

Test specification: the formation of max. 1 drop is permissible at the opening of the valve within one minute.

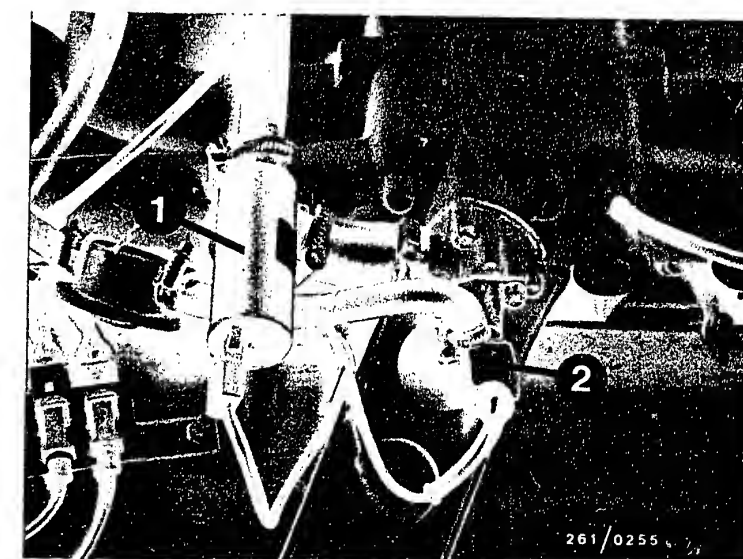
yes

Continued on J15/J16



Thermotime switch  
35° C / 8 s.

2 = Start valve



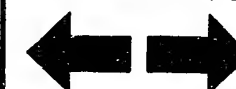
**J13**

Rough idle  
BMW 325e (USA)



**J14**

Rough idle  
BMW 325e (USA)



# Rough idle and/or incorrect idle speed (continued)

yes

Solenoid-operated fuel-injection valves:

1. Mechanically O.K.?
2. O-ring O.K. (unmetered air)?

no

yes

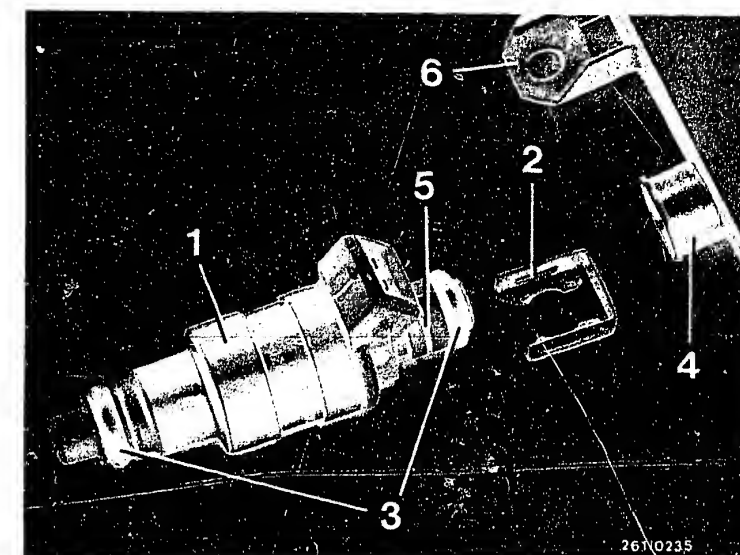
1. With the engine running, disconnect the solenoid-operated fuel-injection valve connectors individually, one after the other, from the injection valve, and plug them back on. If the solenoid-operated fuel-injection valve is good, the engine speed must drop off. If not, take out and replace the solenoid-operated fuel-injection valve.

2. Defective O-rings on the protection sleeve lead to unmetered air and thus to leaning of the mixture. Defective O-rings at the fuel distributor pipe cause leaks and thereby leakage. Take out and replace defective O-rings.

3. If the solenoid-operated fuel-injection valves are clogged with dirt deposits, take out and replace the solenoid-operated fuel-injection valves.

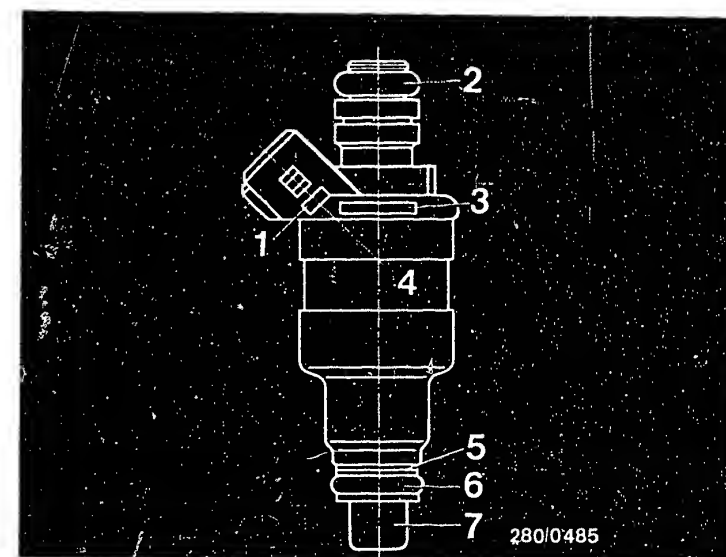
## Taking out the solenoid operated fuel-injection valves

Release the fastening screws on the fuel distribution pipe. Pull the fuel distribution pipe up until the solenoid-operated fuel-injection valves are out of the hole in the intake manifold. Do not damage the nozzle needle or the rubber gasket. Check the nozzle needles and the area around them for tightness of seal and for dirt deposits. Disconnect the electrical connection. Carefully shove the holding bracket out of the slot and pull the solenoid-operated fuel-injection valve out of the fuel distribution pipe connection.



- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab

- 2 = Top O-ring
- 6 = Bottom O-ring
- 7 = Protection sleeve

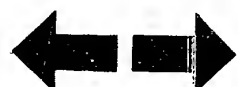


Continued on J19/J20

Continued on J17/J18

**J15**

Rough idle  
BMW 325e (USA)



**J16**

Rough idle  
BMW 325e (USA)



Rough idle and/or incorrect idle speed (continued)

yes

Caution!

Catch any fuel that runs out. Do not allow it to drip on hot portions of the engine. Fire hazard!  
Caution!

The protection sleeve must not be pried off.  
Installation of the solenoid-operated fuel-injection valves

Take out and replace damaged or swollen O-rings.  
Use set of parts 1 287 010 704.

Cut the lower O-ring (intake tube) into pieces.

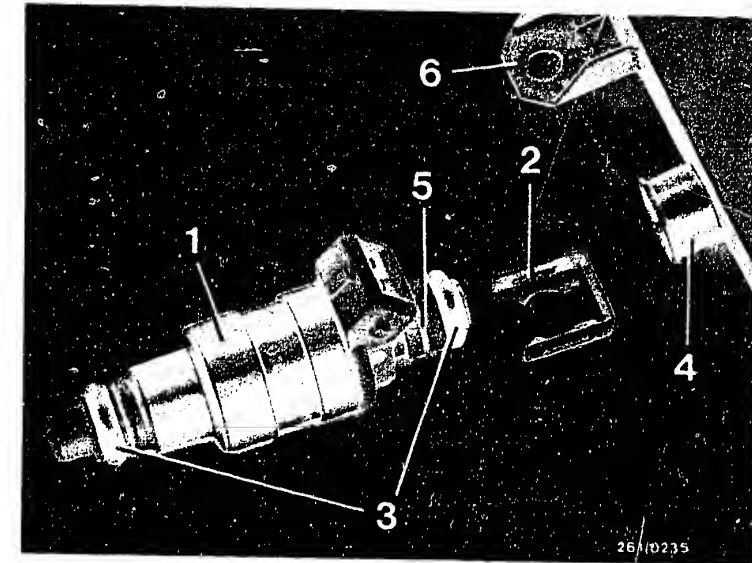
Caution! Do not damage the protection sleeve.

Pull a new O-ring over the protection sleeve and the shoulder on it. Do not damage any parts in so doing.

Before installation, check both rubber gaskets for proper seating. Fasten the solenoid-operated fuel-injection valves to the fuel distribution pipe. All solenoid-operated fuel-injection valves are to be pressed into the seats at the same time using the fuel distribution pipe. Screw the fuel distribution pipe tight. Check all air and fuel hoses for proper seating.

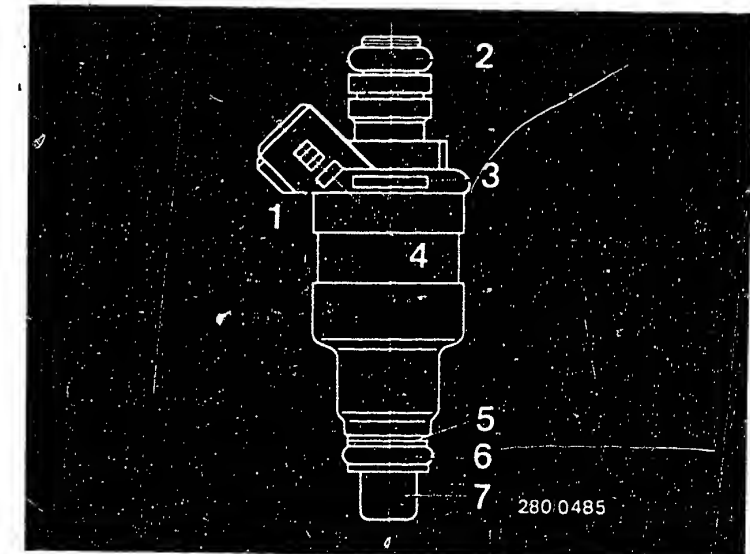
Make electrical connections.

Start the engine and check that no unmetered air is being drawn in.



- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab

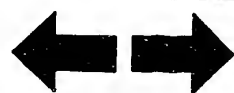
- 2 = Top O-ring
- 6 = Bottom O-ring
- 7 = Protection sleeve



Continued on J19/J20

**J17**

Rough idle  
BMW 325e (USA)



**J18**

Rough idle  
BMW 325e (USA)



## Rough idle and/or incorrect idle speed (continued)

yes

Idle speed with engine at normal operating temperature:  
650 ... 750 min<sup>-1</sup>

Measure the exhaust gas value with the engine at normal operating temperature in front of the catalytic converter:  
0.5 ... 0.8 vol. %CO

Before testing, disconnect the hose to the activated carbon filter, switch off the loads, and take apart the lambda sensor plug connection.

no

- The idle speed cannot be adjusted. It is permanently set in the idle speed control control unit, and is determined by the idle actuator.
- Adjust the exhaust gas using the idle-mixture-adjusting screw in the air-flow sensor. To do so, remove the plug using a special tool.

If the CO cannot be adjusted:

- If the CO-level is too low: repeat the leak test on the intake system.
- If the CO-level is too high: take out and replace the air-flow sensor.

Note:

After adjusting the CO-level, insert a new plug into the air-flow sensor.

yes

Checking the customer complaint

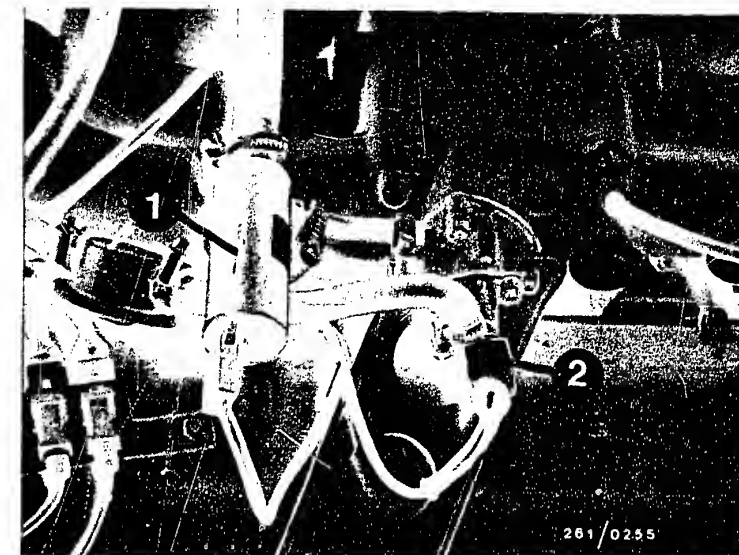
"Rough idle, engine speed adjustment (idle), and exhaust gas setting,"

has been completed.  
Has the customer complaint been corrected?

no

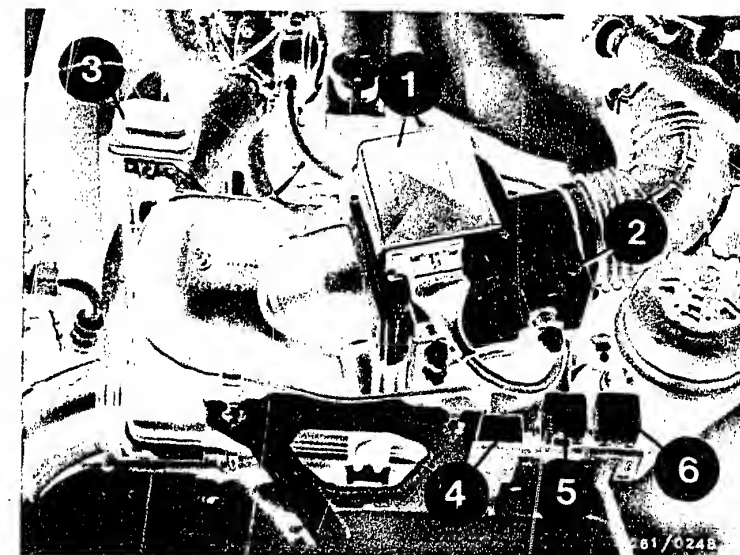
### Additional possible defects

- The customer complaint has been incorrectly identified. (See Coordinates C3 ... C10.) If the defect has not been identified using the "Target Trouble-Shooting", see "Detailed Trouble-Shooting" (Coordinates C3/C4).
- Engine is not O.K. mechanically. (Compression, valve setting, valve timing, wear on camshaft).



1 = Idle actuator  
2 = Start valve

1 = Air-flow sensor with NTC I  
2 = idle-mixture-adjusting screw



**J19**

Rough idle  
BMW 325e (USA)



**J20**

Rough idle  
BMW 325e (USA)





## POOR THROTTLE TAKE-UP

Trouble-shooting program according to customer complaint

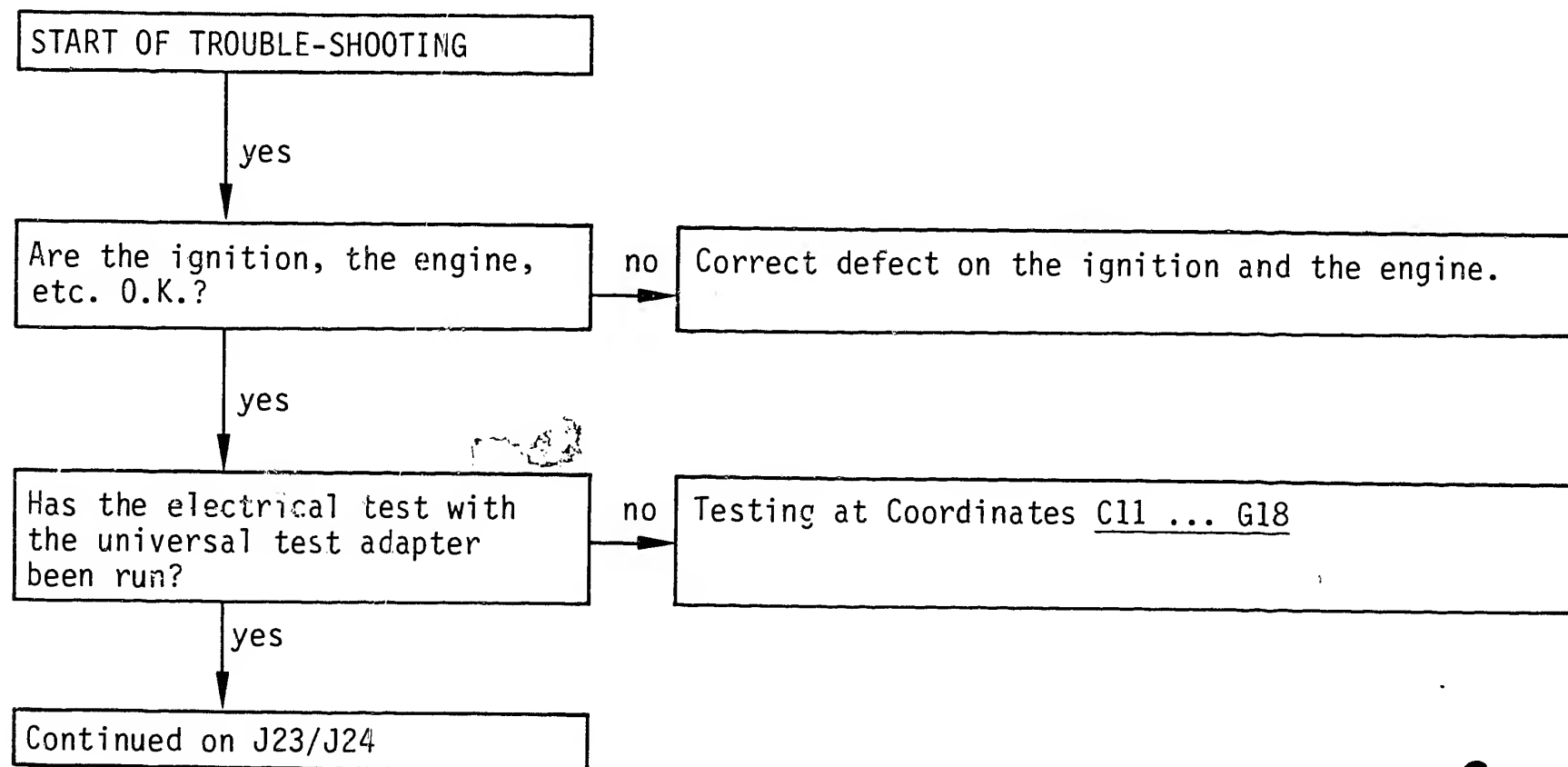
How to use the program

Testing is organized into 3 columns of boxes:

- In the column at the left are the questions for the tests being run.
- In the column in the center the component tests and settings are described.
- The column at the right shows the figures belonging to the text and the legend for the figures.

If it is possible to answer the questions clearly with "yes" even without testing, proceed to the next question below.

On the other hand, if the answer to the question is "no", and a defect is suspected, you must switch to the center column of boxes and carry through the tests indicated there. At the end of the test, the trouble-shooting is continued at that point at which the shift was made previously.



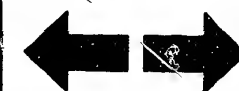
**J21**

Poor throttle take-up  
BMW 325e (USA)



**J22**

Poor throttle take-up  
BMW 325e (USA)



# Poor throttle take-up (continued)

yes

Check the secondary pattern for all cylinders.  
Is the secondary pattern O.K.?

no

Check the ignition coil and the high voltage portion: is the distributor cap covered with oil on the outside and inside? (Unscrew the distributor rotor and check the camshaft seal).

## Notes:

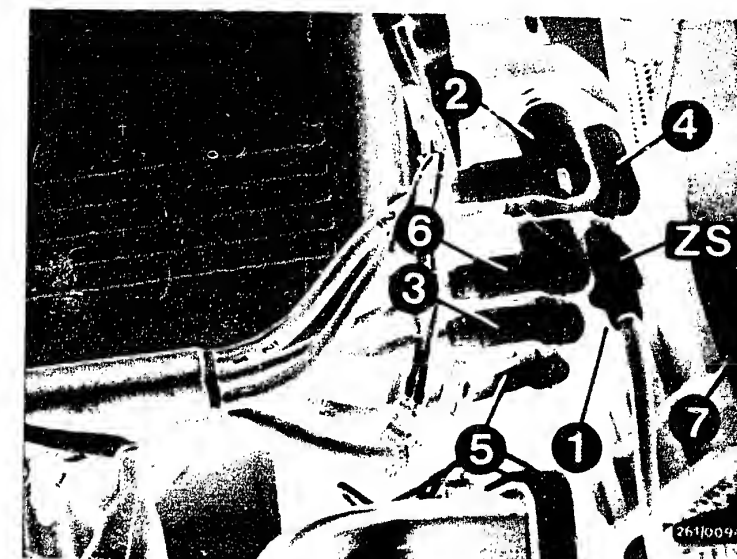
Distributor cap is fastened with 3 screws. To remove the distributor cap the cover of the radiator must be removed. When putting the ignition leads on, watch the cylinder numbers! Do not forget the cover and shielding cap! Check the primary ignition coil for continuity (approx.  $0\Omega$ ). Secondary coil resistance: 5 to 7.2 k $\Omega$ . Check the interference suppression resistors, the ignition leads, and the spark plugs.

## Interference-suppression resistance in

Ignition distributor rotor	1 k $\Omega$
Ignition distributor housings:	each 1 k $\Omega$
Spark-plug connectors:	each 5 k $\Omega$
Spark plugs:	5 k $\Omega$
Ignition coil:	1 k $\Omega$

yes

Continued on K1/K2



## High voltage distributor

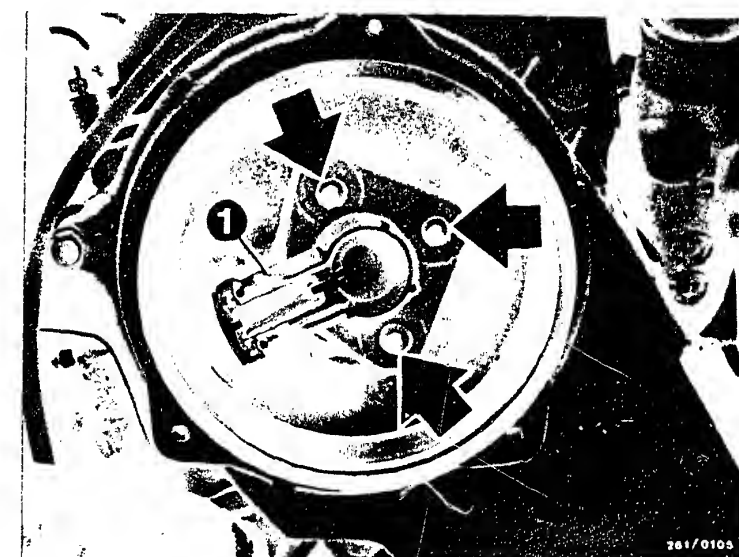
1 - 6 = Cylinder numbers

ZS = High voltage lead to the ignition coil

7 = Radiator cover

1 = Distributor rotor

Arrow = Fastening screws



**J23**

Poor throttle take-up

BMW 325e (USA)



**J24**

Poor throttle take-up

BMW 325e (USA)



Poor throttle take-up (continued)

yes

Is the throttle valve closed?

no

yes

Testing:

Find out whether the throttle valve can be closed even further, causing the engine speed to drop off.

Visual inspection:

Release the hose clamp and remove the hose at the throttle-valve assembly. Has the throttle valve been set for a gap? If need be, make the adjustment. After a correction, readjust the accelerator cable.

Adjustment of the throttle-valve switch:

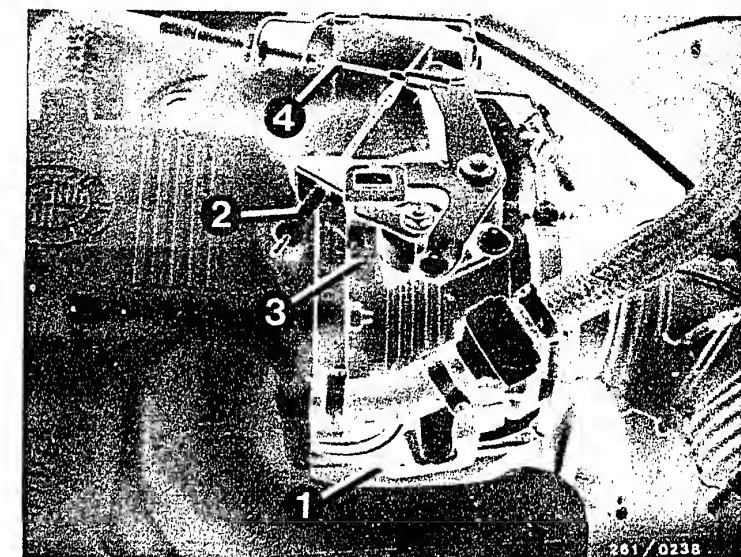
Release the fastening screws somewhat.

Connect an ohmmeter to the throttle-valve switch Term. 2 and ground. Turn the control lever to "full throttle" and slowly return it to the idle stop.

Turn the throttle-valve switch until the internal stop becomes perceptible. (Reading:  $0\Omega$ ).

Checking the setting:

Pull on the accelerator cable somewhat. The idle contact must switch audibly. (Reading:  $\infty\Omega$ ).

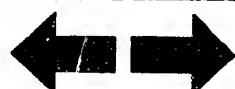


- 1 = Throttle-valve switch
- 2 = Accelerator cable
- 3 = Idle stop screw
- 4 = Cable to the automatic transmission

Continued on K3/K4

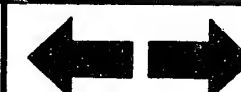
**K1**

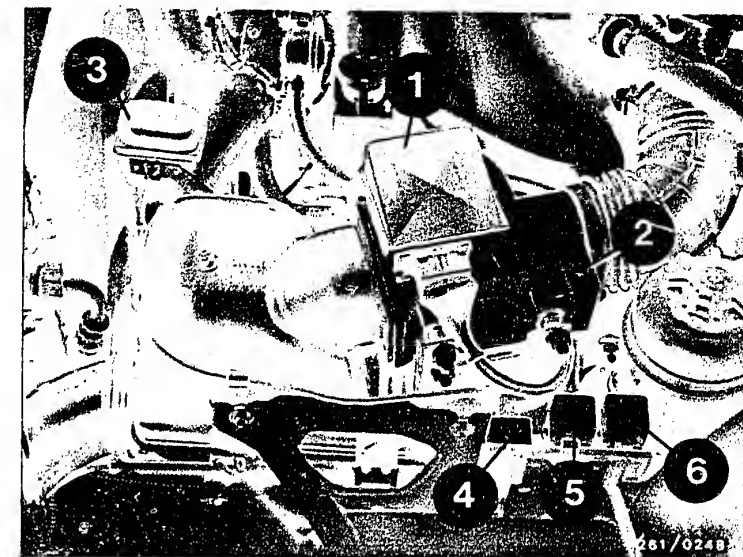
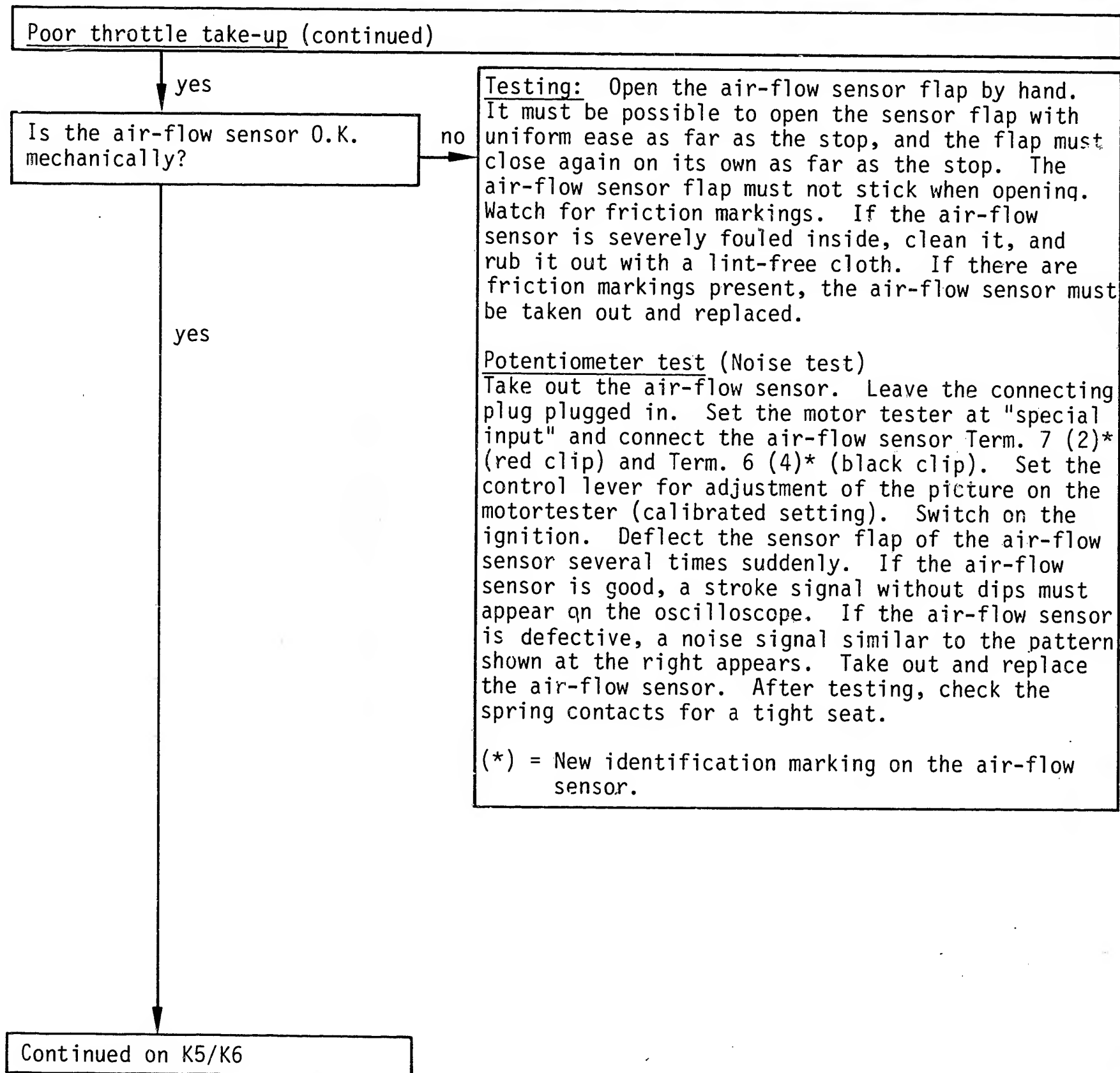
Poor throttle take-up  
BMW 325e (USA)



**K2**

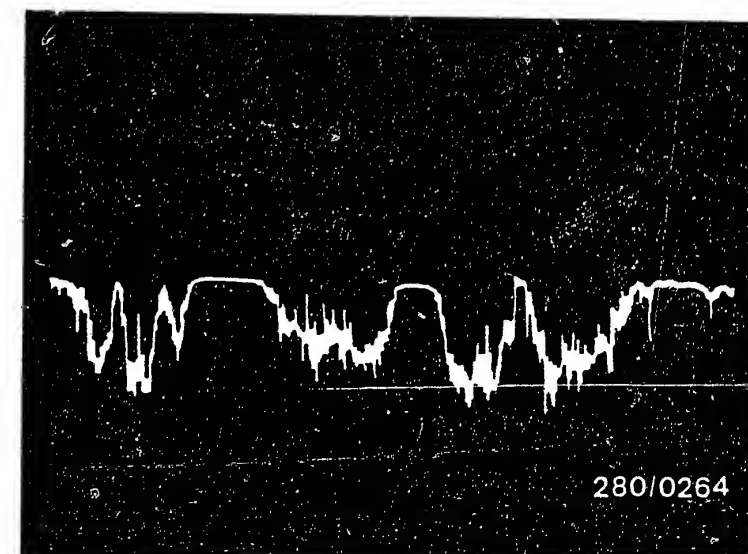
Poor throttle take-up  
BMW 325e (USA)





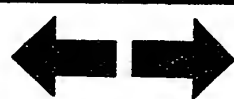
1 = Air-flow sensor with NTC I  
2 = Idle-mixture -adjusting screw

Noise signal with defective air-flow sensor



**K3**

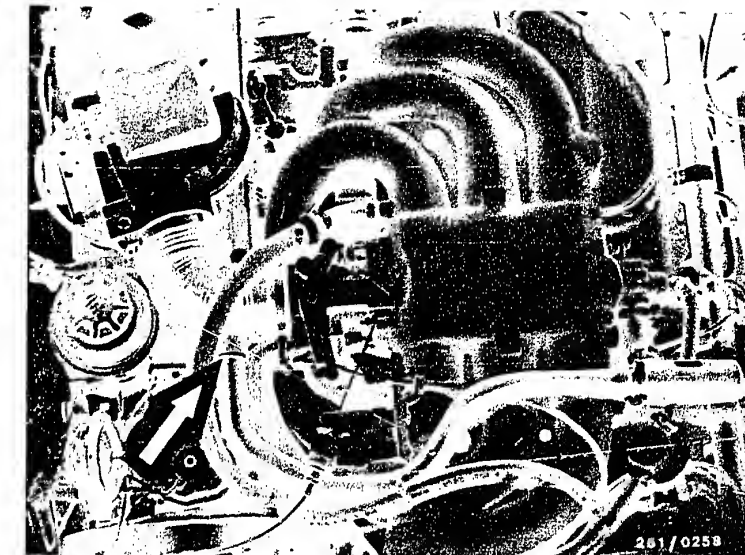
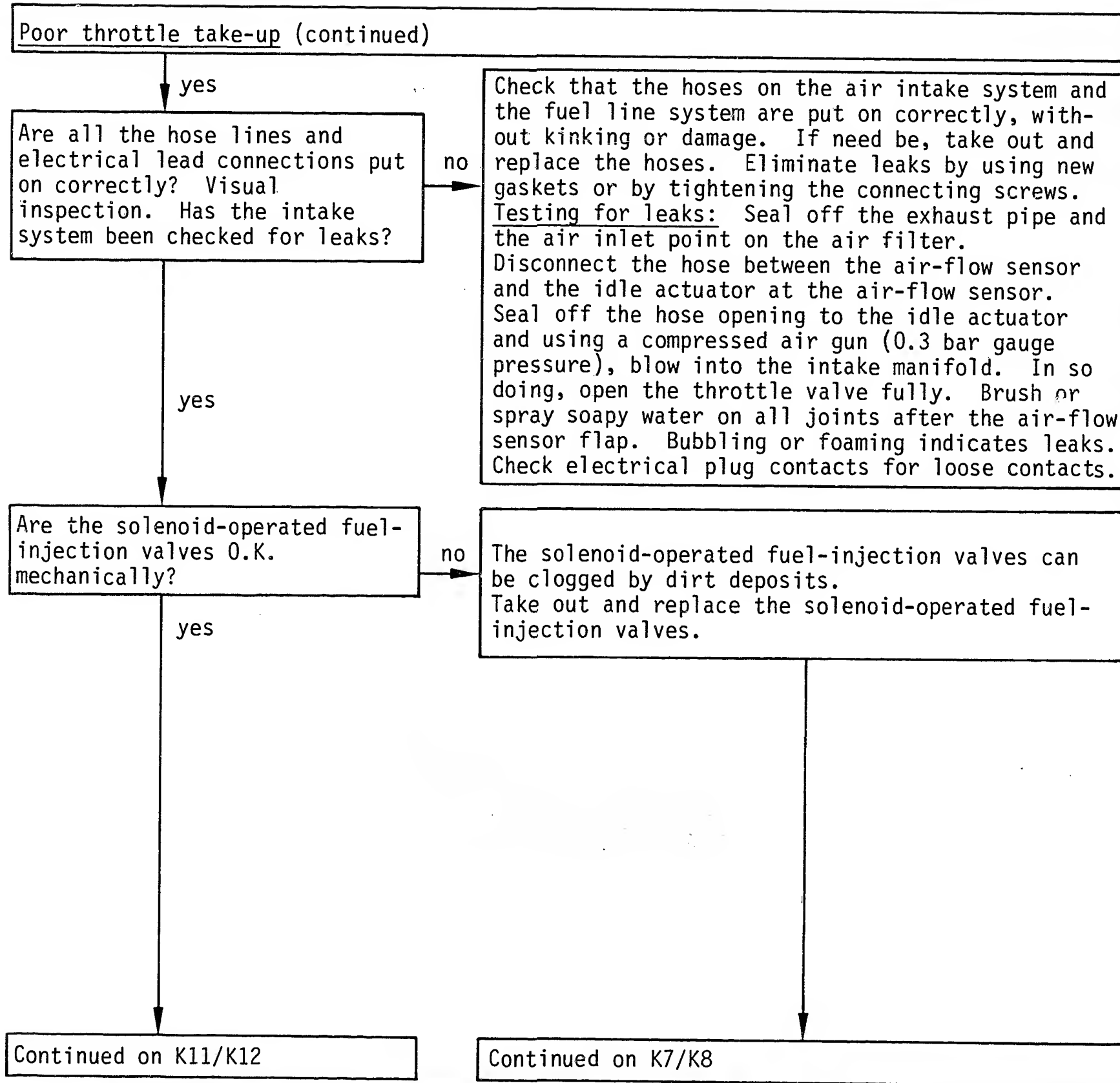
Poor throttle take-up  
BMW 325e (USA)



**K4**

Poor throttle take-up  
BMW 325e (USA)

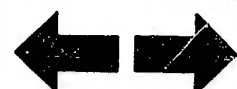




Arrow = Disconnect hose here for leak test.

**K5**

Poor throttle take-up  
BMW 325e (USA)



**K6**

Poor throttle take-up  
BMW 325e (USA)





# Poor throttle take-up (continued)

yes

## Taking out the solenoid-operated fuel-injection valves

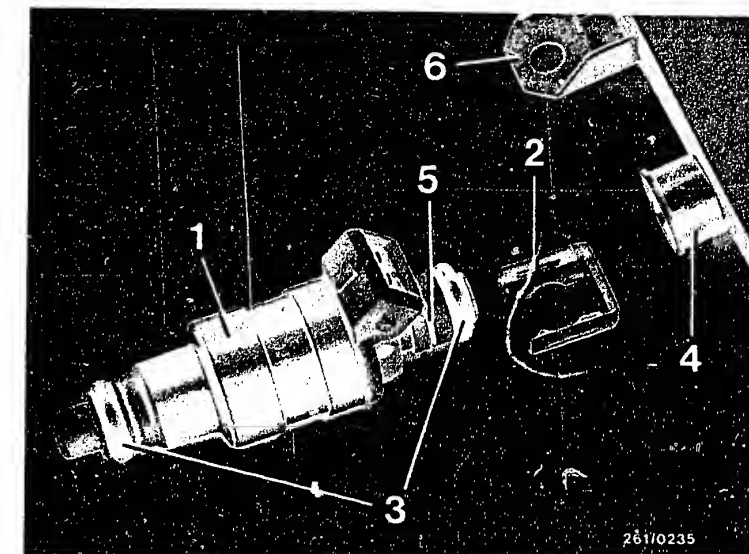
Release the fastening screws on the fuel distribution pipe. Pull the fuel distribution pipe up until the solenoid-operated fuel-injection valves are out of the hole in the intake manifold. Do not damage the nozzle needle or the rubber gasket.

Check the nozzle needles and the area around them for tightness of seal and for dirt deposits. Disconnect the electrical connection. Carefully shove the holding bracket out of the slot and pull the solenoid-operated fuel-injection valve out of the fuel distribution pipe connection.

yes

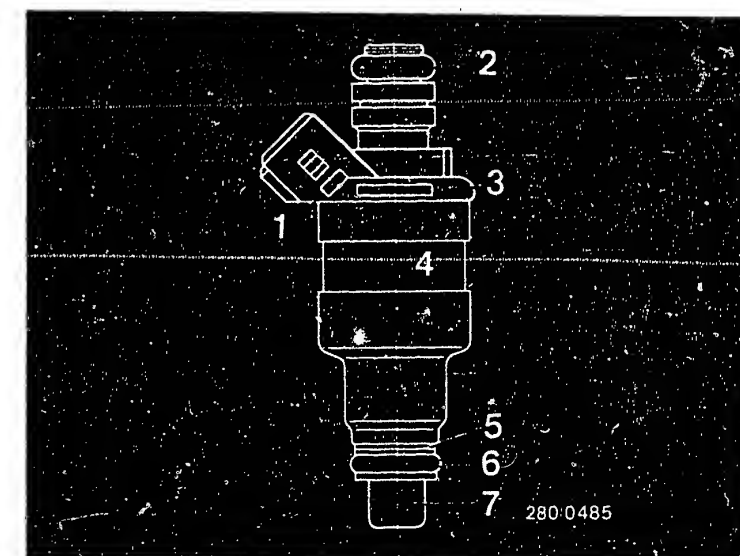
Continued on K11/K12

Continued on K9/K10



- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab

- 2 = Top O-ring
- 6 = Bottom O-ring
- 7 = Protection sleeve



**K7**

Poor throttle take-up  
BMW 325e (USA)



**K8**

Poor throttle take-up  
BMW 325e (USA)



# Poor throttle take-up (continued)

yes

## Caution!

Catch any fuel that runs out.  
Do not allow it to drip on hot portions of the engine. Fire hazard!

## Caution!

The protection sleeve must not be pried off.  
Installation of the solenoid-operated fuel-injection valves

Take out and replace damaged or swollen O-rings.  
Use set of parts 1 287 010 704.

Cut the lower O-ring (intake tube) into pieces.

Caution! Do not damage the protection sleeve.

Pull a new O-ring over the protection sleeve and the shoulder on it. Do not damage any parts in so doing.

Before installation, check both rubber gaskets for proper seating. Fasten the solenoid-operated fuel-injection valves to the fuel distribution pipe.

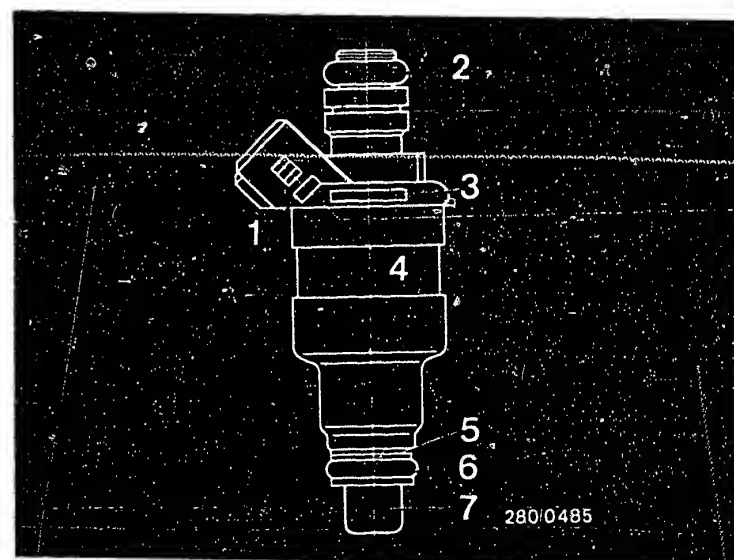
All solenoid-operated fuel-injection valves are to be pressed into the seats at the same time using the fuel distribution pipe. Screw the fuel distribution pipe tight. Check all air and fuel hoses for proper seating.

Make electrical connections.

Start the engine and check that no unmetered air is being drawn in.

- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab

- 2 = Top O-ring
- 6 = Bottom O-ring
- 7 = Protection sleeve



Continued on K11/K12

**K9**

Poor throttle take-up  
BMW 325e (USA)



**K10**

Poor throttle take-up  
BMW 325e (USA)



# Poor throttle take-up (continued)

yes

Is the idle speed control (from VDO) O.K.?

no

If the engine hunts, take out and replace the idle speed control control unit (Figure at the top - Item 3). Measure the coil resistance of the idle actuator (Figure at center - Item 1): if there is a break or if the reading is  $0\Omega$ , the actuator is defective.

Measure the pulses on the actuator plug. Pulses must be visible on the oscilloscope at idle speed (Figure at the bottom). If there are no pulses: examine the power supply for the idle speed control control unit and/or take out and replace the idle speed control control unit.

Additional cause of defects:  
The actuator is mechanically defective.

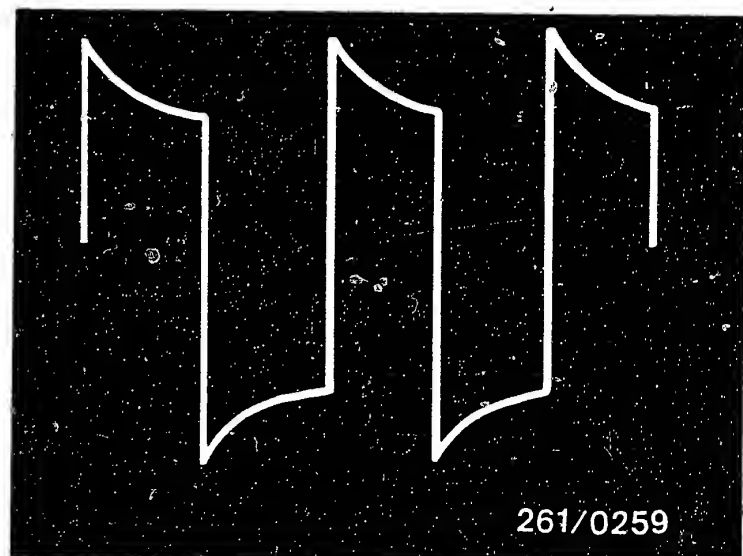
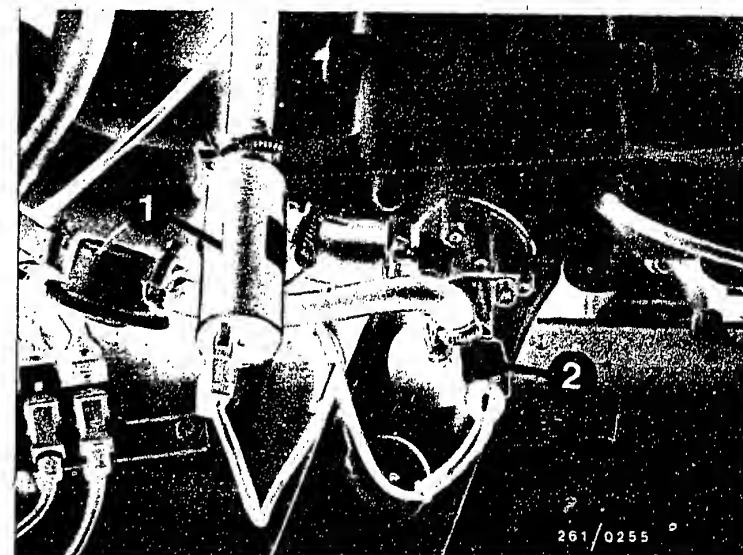
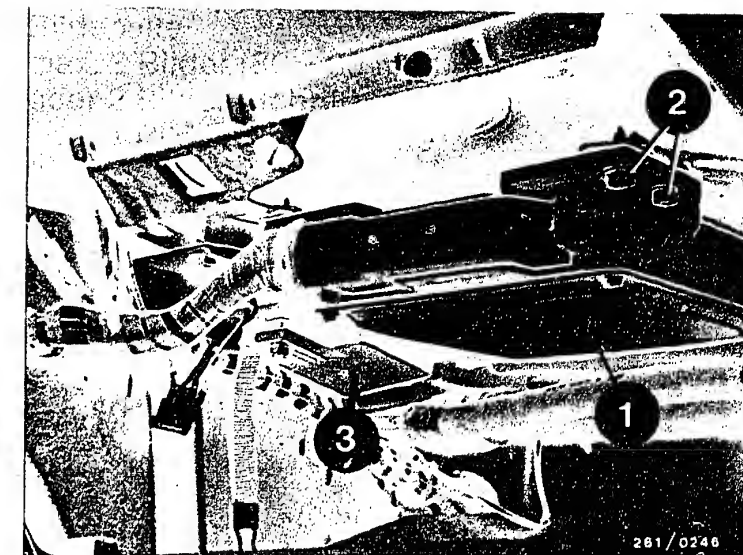
yes

Checking the customer complaint  
"Poor throttle take-up"  
has been completed.  
Has the customer complaint been corrected?

no

## Additional possible defects

- The customer complaint has been incorrectly identified. (See Coordinates C3 ... C10.) If the defect has not been identified using the "Targeted Trouble-Shooting", see "Detailed Trouble-Shooting" (Coordinates C3/C4).
- Engine is not O.K. mechanically. (Compression, valve setting, valve timing, wear on camshaft).



**K11**

Poor throttle take-up  
BMW 325e (USA)



**K12**

Poor throttle take-up  
BMW 325e (USA)



## ENGINE MISSING IN ALL DRIVING CONDITIONS

Trouble-shooting program according to customer complaint

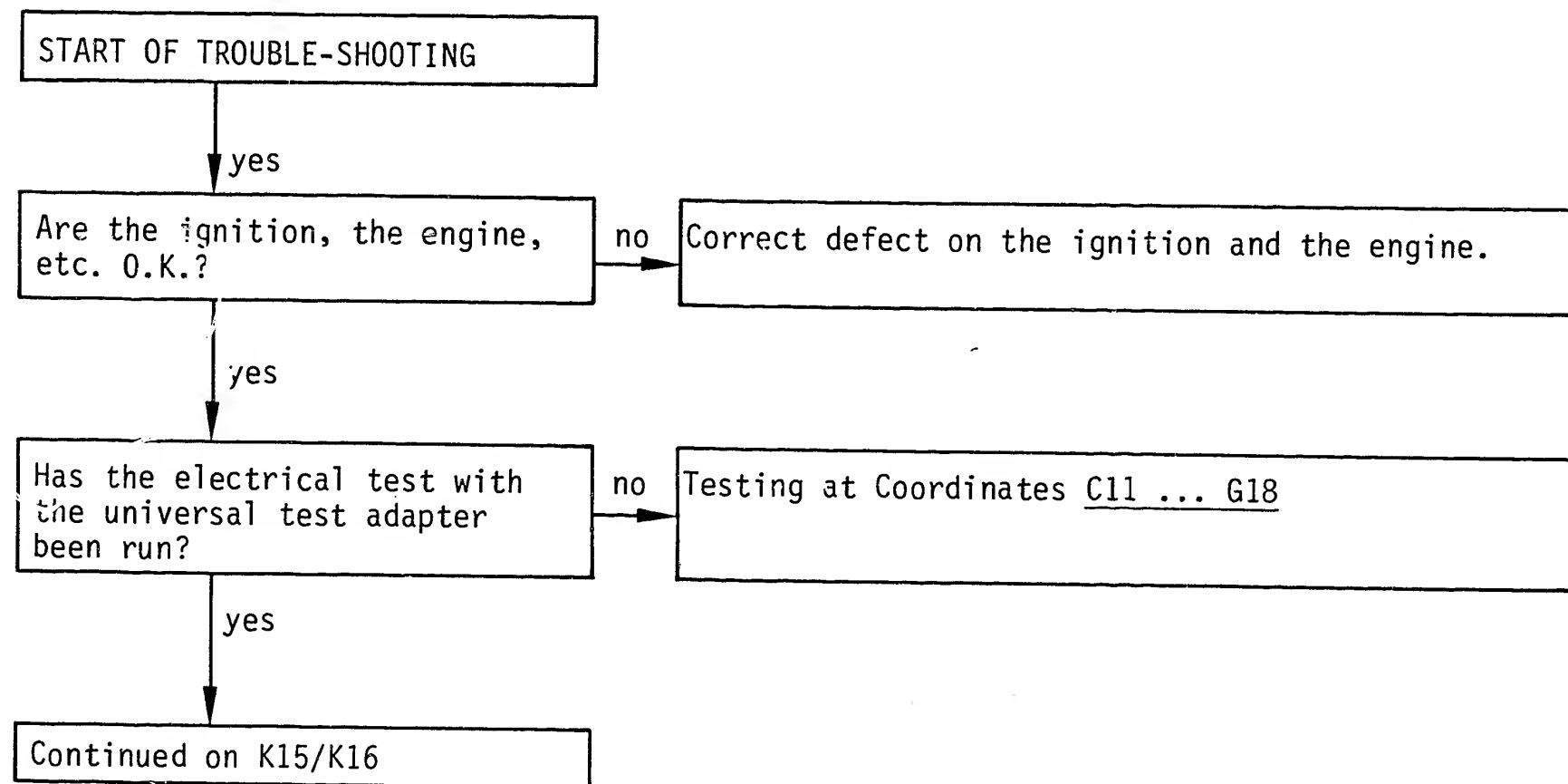
How to use program

Testing is organized into 3 columns of boxes:

- In the column at the left are the questions for the tests being run.
- In the column in the center the component tests and settings are described.
- The column at the right shows the figures belonging to the text and the legend for the figures.

If it is possible to answer the questions clearly with "yes" even without testing, proceed to the next question below.

On the other hand, if the answer to the question is "no", and a defect is suspected, you must switch to the center column of boxes and carry through the tests indicated there. At the end of the test, the trouble-shooting is continued at that point at which the shift was made previously.



**K13**

Engine missing in all driving conditions  
BMW 325e (USA)



**K14**

Engine missing in all driving conditions  
BMW 325e (USA)



Engine missing in all driving conditions (continued)

yes

Check the secondary pattern for all cylinders. Is the secondary pattern O.K.?

no

Check the ignition coil and the high voltage portion: is the distributor cap covered with oil on the outside and inside? (Unscrew the distributor rotor and check the camshaft seal).

Notes:

Distributor cap is fastened with 3 screws. To remove the distributor cap the cover of the radiator must be removed. When putting the ignition leads on, watch the cylinder numbers! Do not forget the cover and shielding cap! Check the primary ignition coil for continuity (approx  $0\Omega$ ). Secondary coil resistance: 5 to 7.2 k $\Omega$ . Check the interference suppression resistors, the ignition leads, and the spark plugs.

Interference-suppression resistance in

Ignition distributor rotor:	1 k $\Omega$
Ignition distributor housings:	each 1 k $\Omega$
Spark-plug connectors:	each 5 k $\Omega$
Spark plugs:	5 k $\Omega$
Ignition coil:	1 k $\Omega$

yes

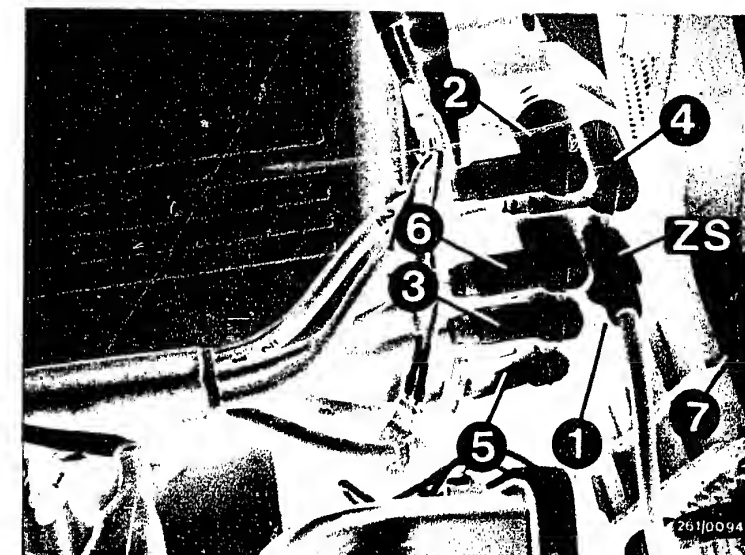
Are the plug connections for the wiring harness and the ground terminal O.K.?

no

Look for engine missing due to loose contacts as follows: have the engine run, if possible on the chassis dynamometer. Hold the engine speed constant and watch for missing. In so doing, move the wiring harness and a plug connection. Pay particular attention to the plug connection at the rotational-speed and reference marker sensors. Is the ground terminal tightened firmly? Check plug connections for correct seating and corrosion. The spring contacts must be latched in and it must not be possible to shove them back! Check the ground leads for continuity and loose contact.

yes

Continued on K17/K18



High voltage distributor

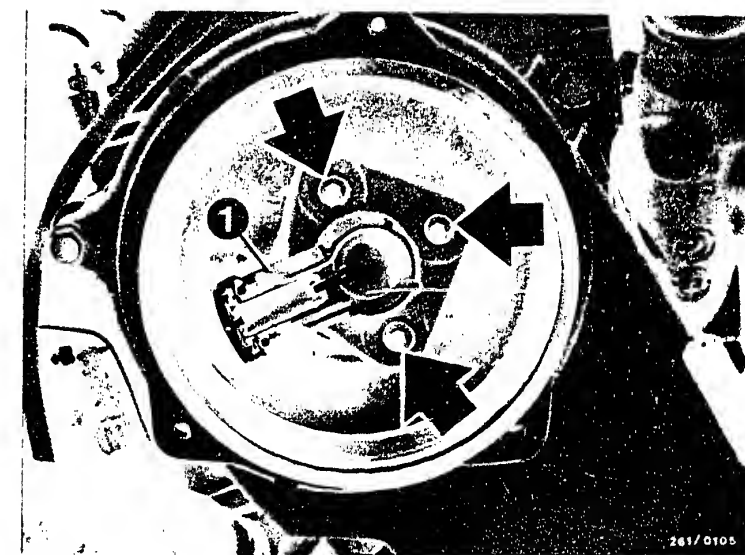
1 - 6 = Cylinder numbers

ZS = High voltage lead to the ignition coil

7 = Radiator cover

1 = Distributor rotor

Arrow = Fastening screws



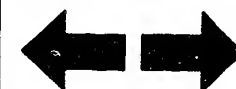
**K15**

Engine missing in all driving conditions  
BMW 325e (USA)

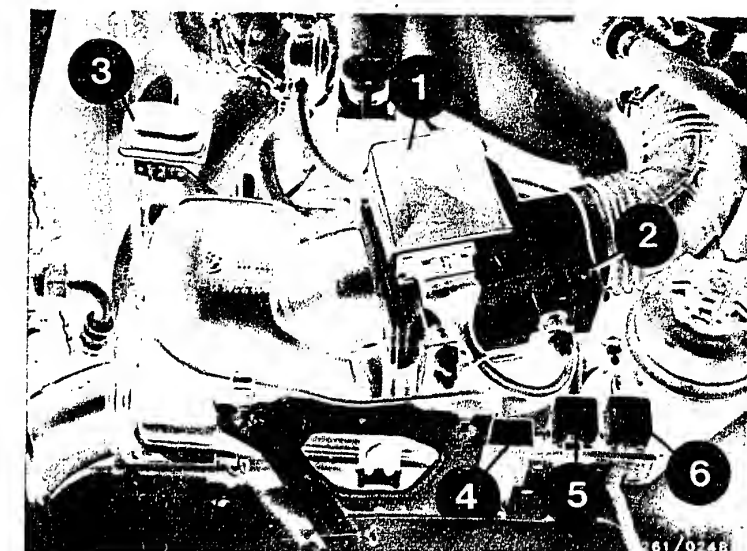
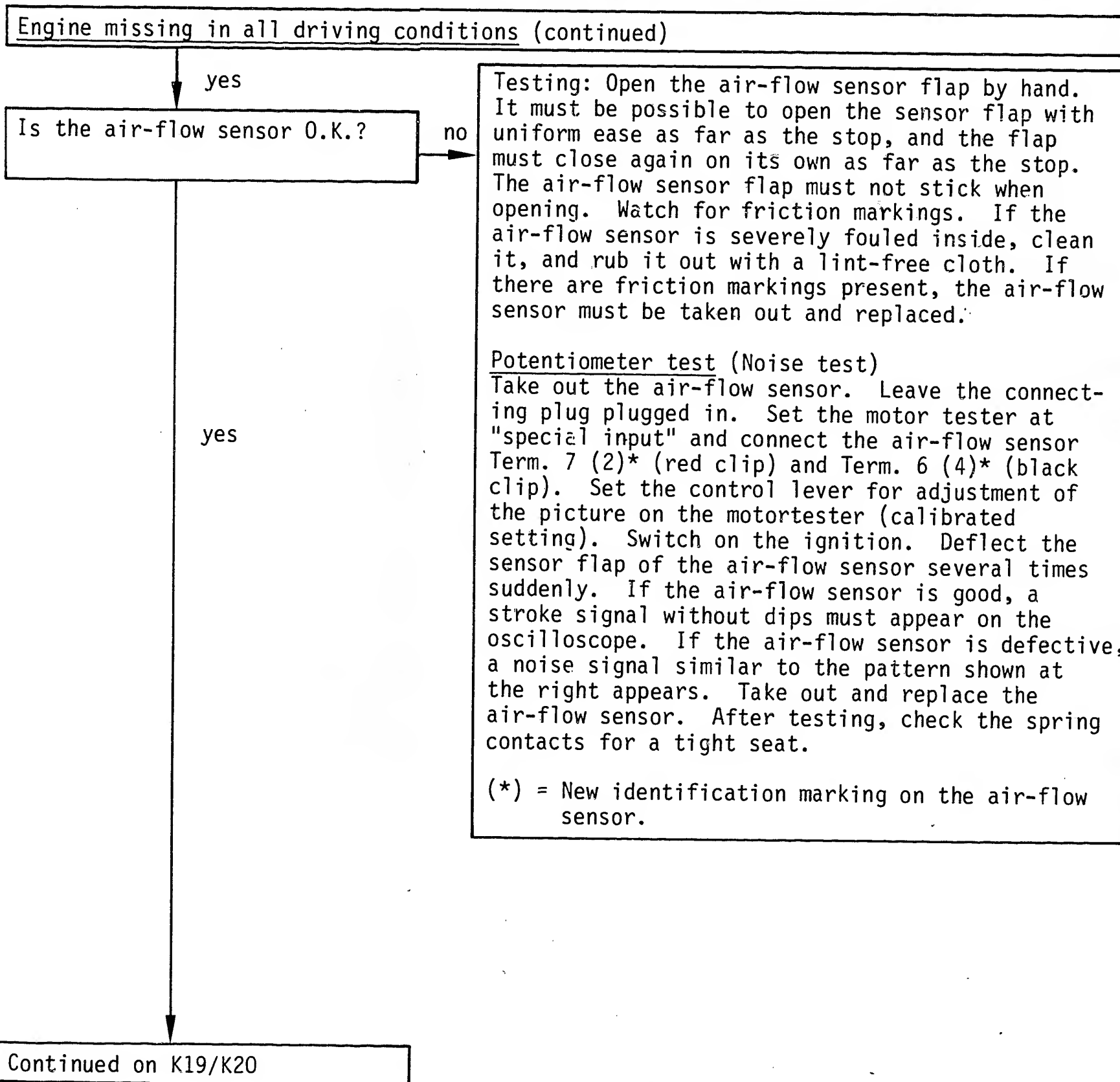


**K16**

Engine missing in all driving conditions  
BMW 325e (USA)

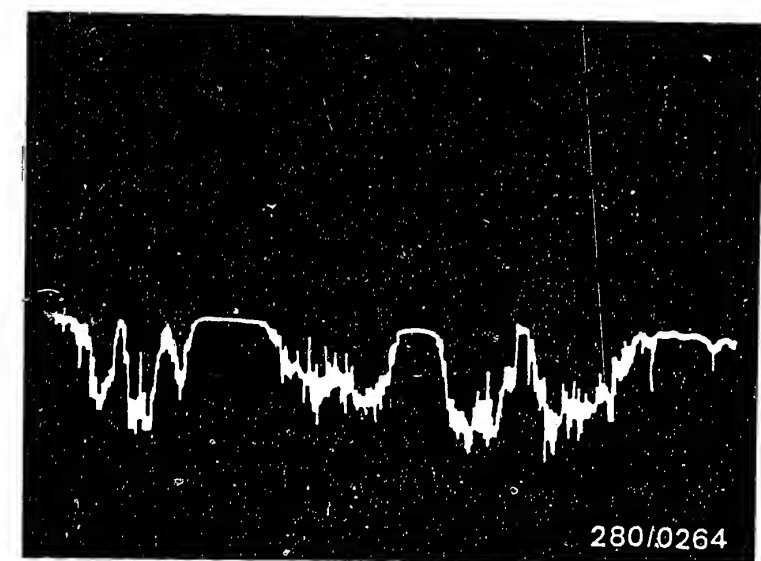






1 = Air-flow sensor with NTC I  
2 = Idle-mixture-adjusting screw

Noise signal with defective air-flow sensor



Engine missing in all driving conditions (continued)

yes

Is the fuel delivery O.K.?

no

Measure the fuel delivery:

To test, release the connection between the fuel return hose (from the pressure regulator) and the fuel return line (to the fuel tank). If need be, extend the hose and direct into a 5 l container with a measuring scale. Build up the fuel pressure: on the universal test adapter, set the program switch "V" in setting 17. Switch the ignition on and press button T3.

Test specification: min. 750 cm<sup>3</sup>/30 s

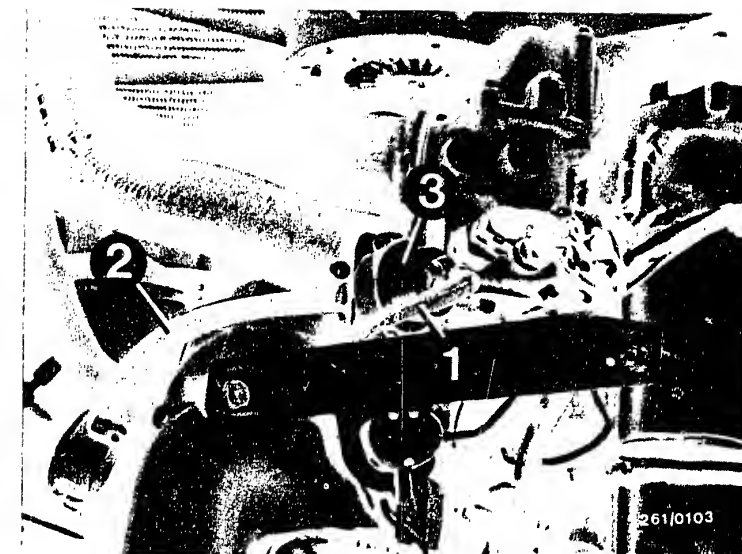
Corrective action if the specification is not attained.

- Fuel filter is clogged: take it out and replace it.
- Is the voltage at the fuel pump plugs min. 12 V with the engine running? If not, clean the contacts. Eliminate any poor ground connection. Take out and replace the leads.
- Check the pre-supply pump. Check by listening: Disconnect the connecting plug at the electric fuel pump. Build up the fuel pressure: on the universal test adapter, set the program switch "V" in setting 17. Switch the ignition on and press button T3. The pre-supply pump must run. If not, check the connecting leads and if need be, take out and replace the pre-supply pump.

yes

yes

Continued on K21/K22



1 = Air hose

2 = Fuel return line

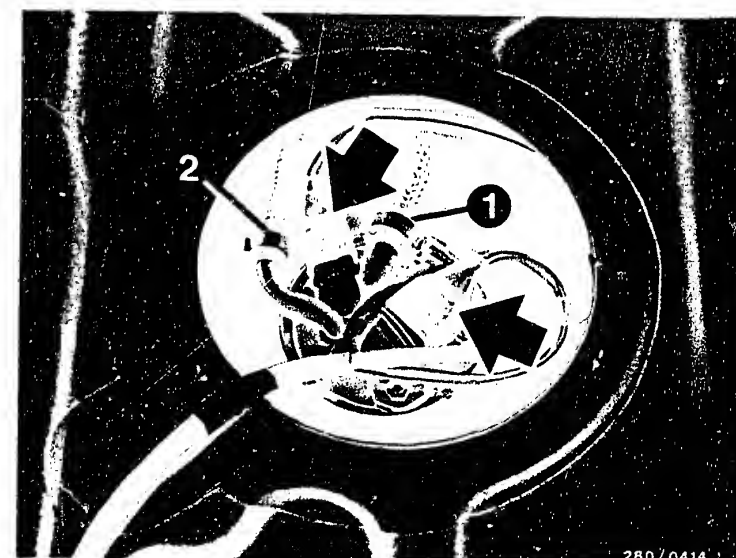
3 = Pressure regulator

Pre-supply pump: under the mat in the luggage compartment.

1 = Fuel delivery line to the electric fuel pump

2 = Fuel return line

Arrows = Connection plug, 2-pole; pre-supply pump, 3-pole, immersion tube sensor



**K19**

Engine missing in all driving conditions  
BMW 325e (USA)



**K20**

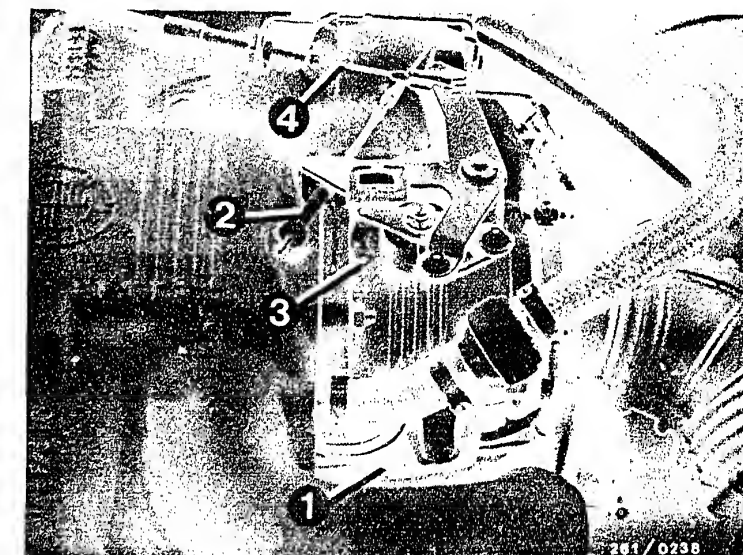
Engine missing in all driving conditions  
BMW 325e (USA)



Engine missing in all driving conditions (continued)

yes

- The fuel pressure regulator is defective: take it out and replace it. The fuel pressure regulator is fastened to the fuel distribution pipe using two fastening screws and across an O-ring. After the pressure regulator is taken out, the O-ring and the flat ring must be taken out and replaced. (Use set of parts 1 287 010 704).
- The fuel pump output is too low: take out and replace the fuel pump.
- Is the filter in the tank clogged? Is there corrosion in the tank?



- 1 = Throttle-valve switch  
2 = Accelerator cable  
3 = Idle stop screw  
4 = Cable to the automatic transmission

Does the engine cough on over-run?

no

1. Check the exhaust system for leaks.
2. Is the throttle valve closed?  
Find out whether the throttle valve can be closed even further, causing the engine speed to drop off.  
Visual inspection:  
Release the hose clamp and remove the hose at the throttle-valve assembly. Has the throttle valve been set for a gap? If need be, make correction at the idle stop screw. After a correction, readjust the accelerator cable.

yes

Continued on K23/K24

**K21**

Engine missing in all driving conditions  
BMW 325e (USA)



**K22**

Engine missing in all driving conditions  
BMW 325e (USA)

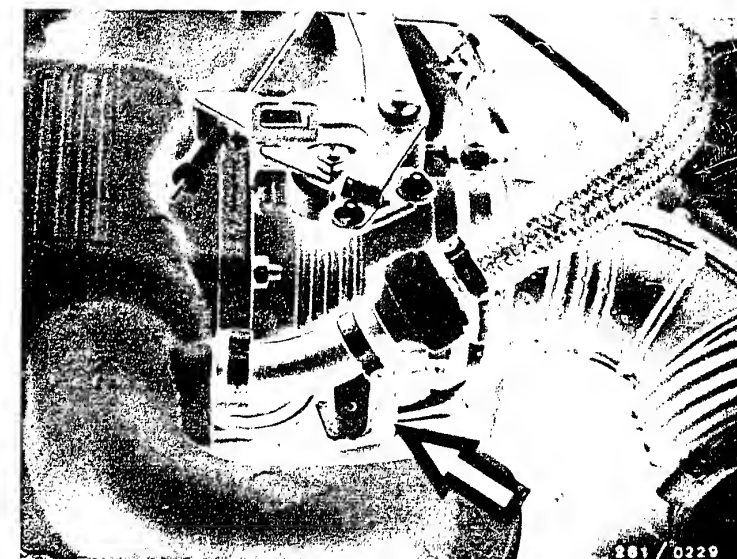


Engine missing in all driving conditions (continued)

yes

Adjustment of the throttle-valve switch:  
Release the fastening screws somewhat.  
Connect an ohmmeter to the throttle-valve switch Term. 2 and ground. Turn the control lever to "full throttle" and slowly return it to the idle stop.  
Turn the throttle-valve switch until the internal stop becomes perceptible. (Reading:  $0\Omega$ ).

Checking the setting:  
Pull on the accelerator cable somewhat. The idle contact must switch audibly. (Reading:  $\infty\Omega$ ).



Arrow = Throttle-valve switch

Is the control unit O.K.?

no

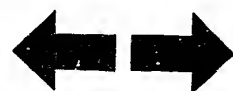
Have the engine run. Shake the control unit lightly and move the control unit plug. Watch for engine missing. Correct the plug connection on the control unit plug or take out and replace a defective control unit.

yes

Continued on L1/L2

**K23**

Engine missing in all driving conditions  
BMW 325e (USA)

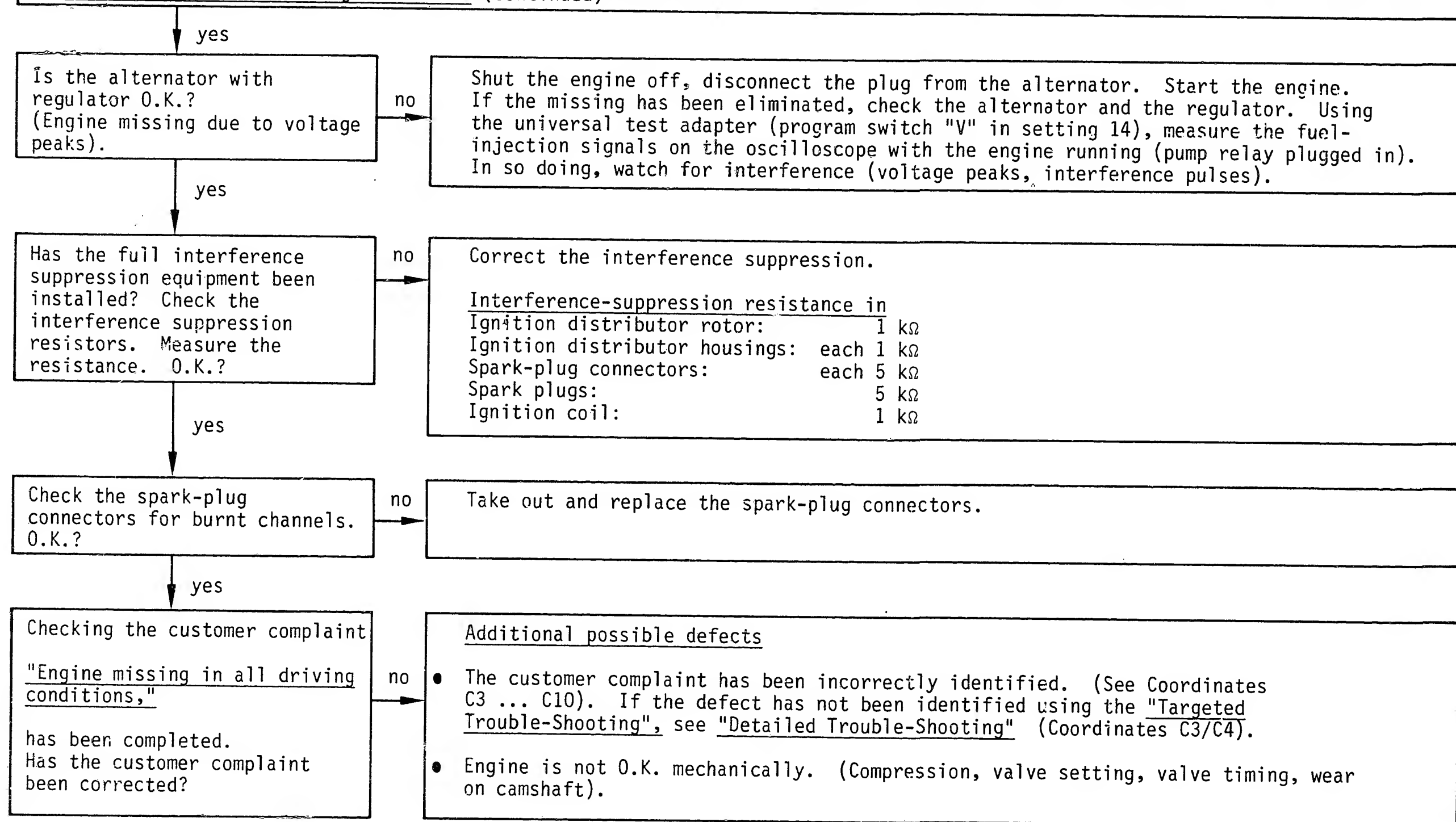


**K24**

Engine missing in all driving conditions  
BMW 325e (USA)



Engine missing in all driving conditions (continued)



L1

Engine missing in all driving conditions  
BMW 325e (USA)



L2

Engine missing in all driving conditions  
BMW 325e (USA)





## POOR MILEAGE

### Trouble-shooting program according to customer complaint

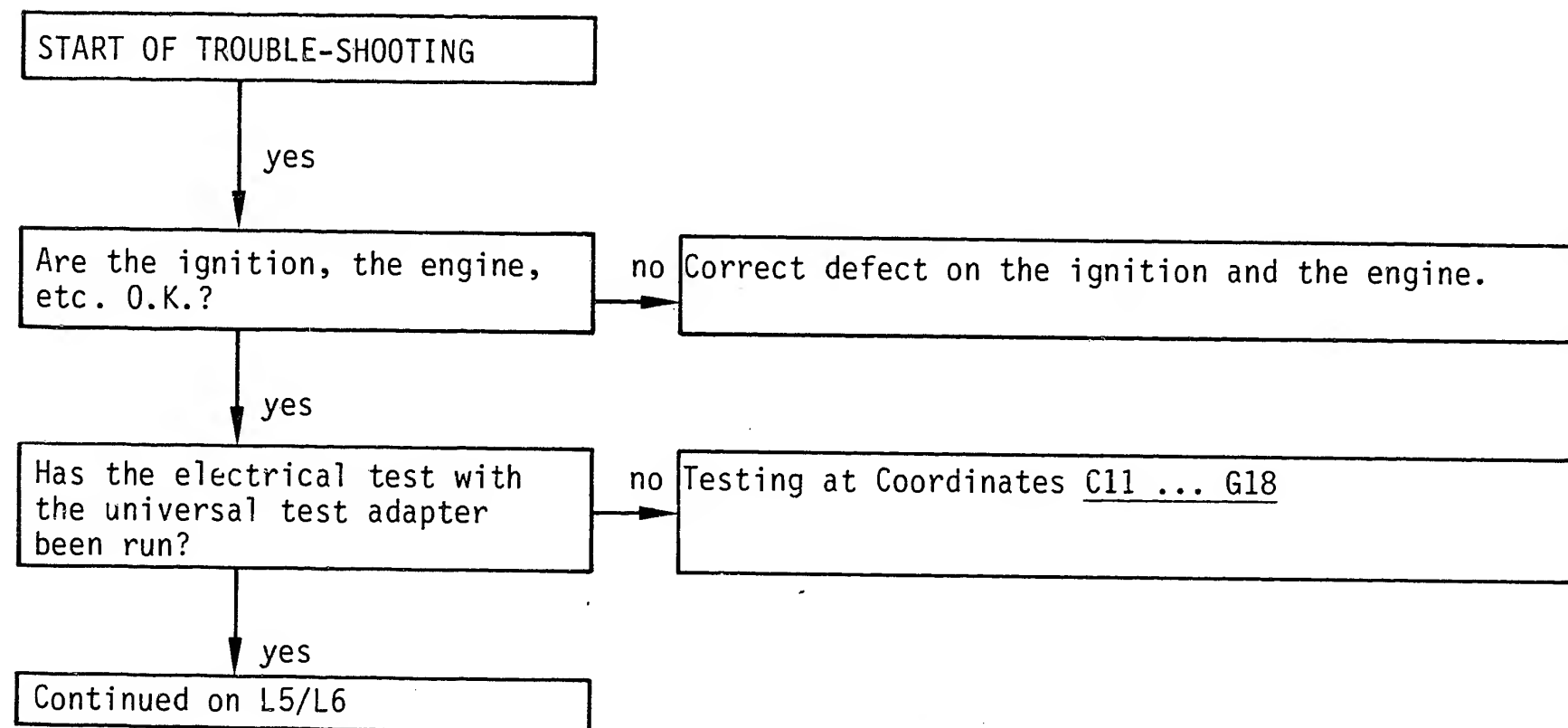
#### How to use the program

Testing is organized into 3 columns of boxes:

- In the column at the left are the questions for the test being run.
- In the column in the center the component tests and settings are described.
- The column at the right shows the figures belonging to the text and the legend for the figures.

If it is possible to answer the questions clearly with "yes" even without testing, proceed to the next question below.

On the other hand, if the answer to the question is "no", and a defect is suspected, you must switch to the center column of boxes and carry through the tests indicated there. At the end of the test, the trouble-shooting is continued at that point at which the shift was made previously.

**L3**

Poor mileage  
BMW 325e (USA)

**L4**

Poor mileage  
BMW 325e (USA)



Poor mileage (continued)

yes

Check the secondary pattern for all cylinders. Is the secondary pattern O.K.?

no

Check the ignition coil and the high voltage portion: is the distributor cap covered with oil on the outside and inside? (Unscrew the distributor rotor and check the camshaft seal.)

Notes:

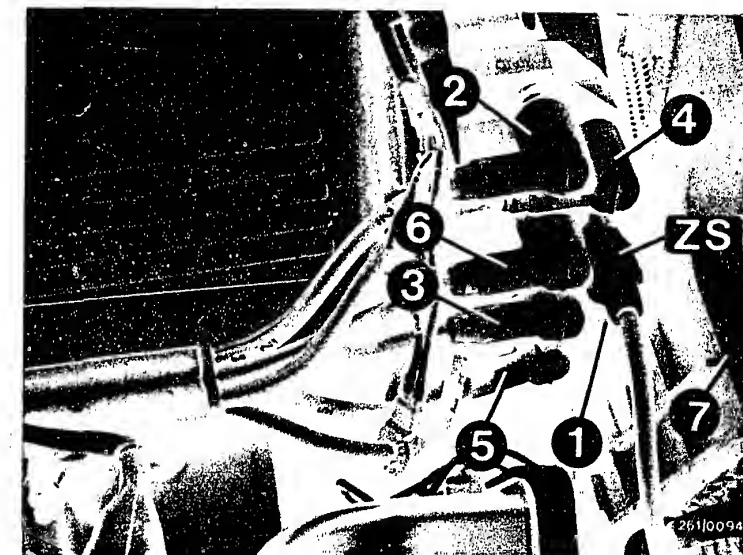
Distributor cap is fastened with 3 screws. To remove the distributor cap the cover of the radiator must be removed. When putting the ignition leads on, watch the cylinder numbers! Do not forget the cover and shielding cap! Check the primary ignition coil for continuity (approx.  $0\Omega$ ). Secondary coil resistance: 5 to 7.2 k $\Omega$ . Check the interference suppression resistors, the ignition leads, and the spark plugs.

Interference-suppression resistance in

Ignition distributor rotor:	1 k $\Omega$
Ignition distributor housings: each	1 k $\Omega$
Spark-plug connectors: each	5 k $\Omega$
Spark plugs:	5 k $\Omega$
Ignition coil:	1 k $\Omega$

yes

Continued on L7/L8



High voltage distributor

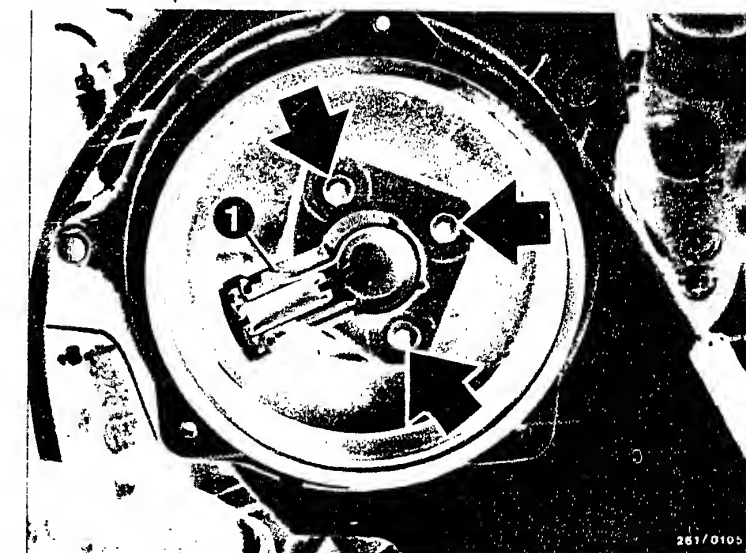
1 - 6 = Cylinder numbers

ZS = High voltage lead to the ignition coil

7 = Radiator cover

1 = Distributor rotor

Arrow = Fastening screws



L5

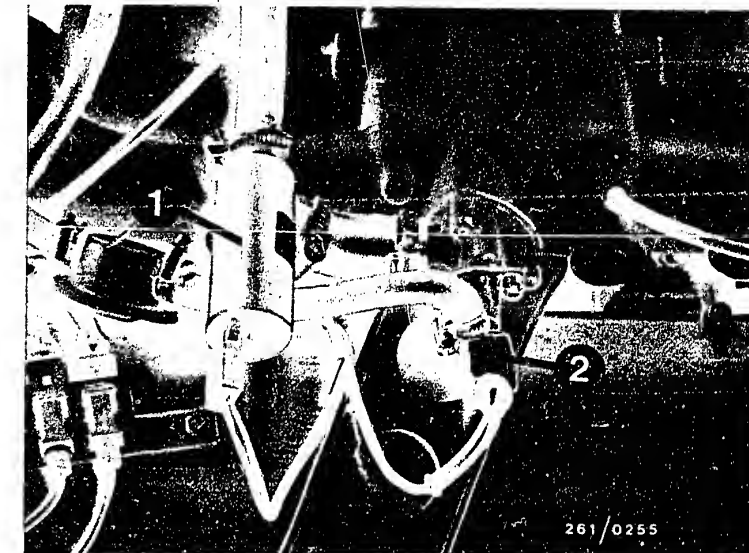
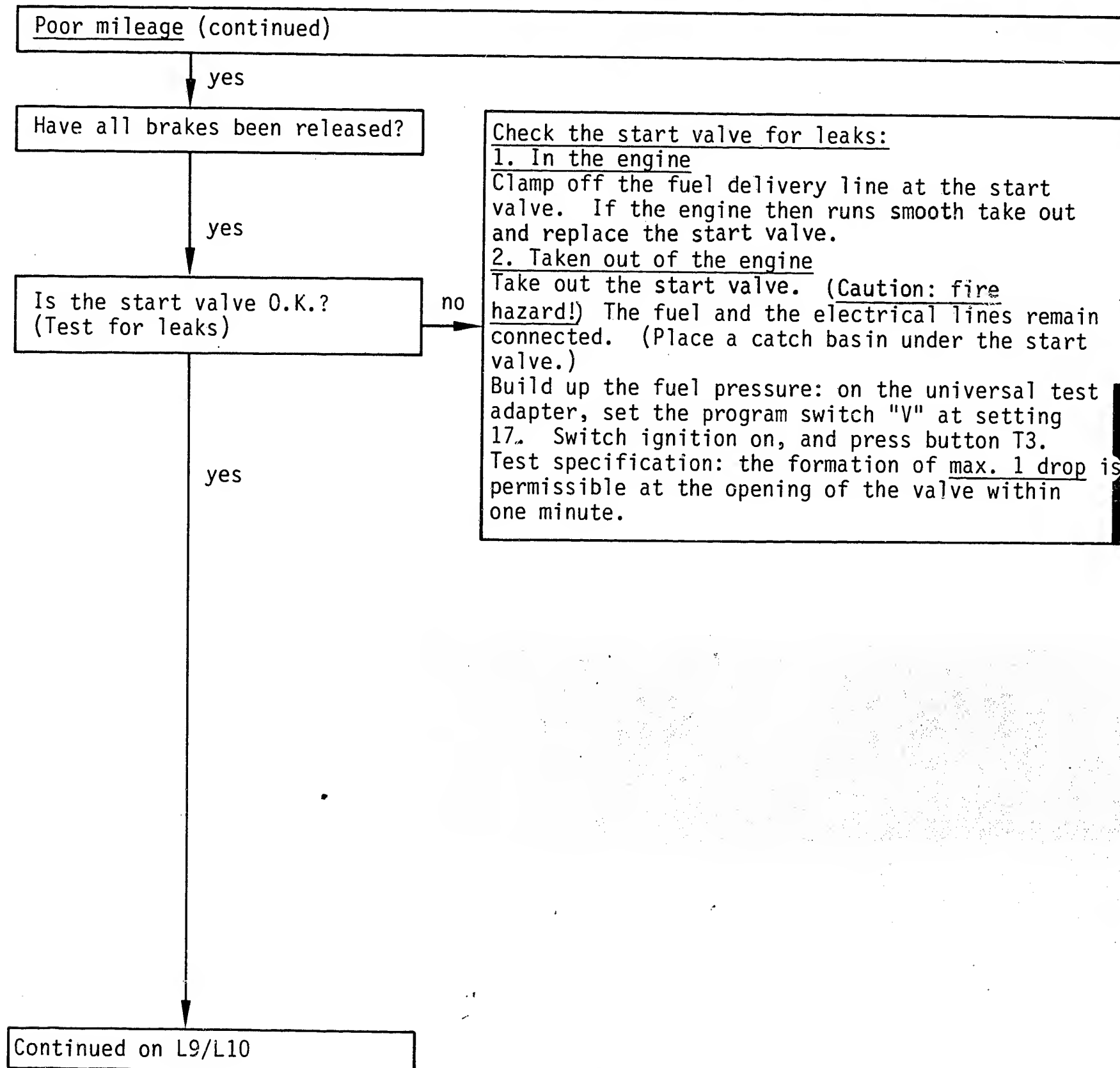
Poor mileage  
BMW 325e (USA)



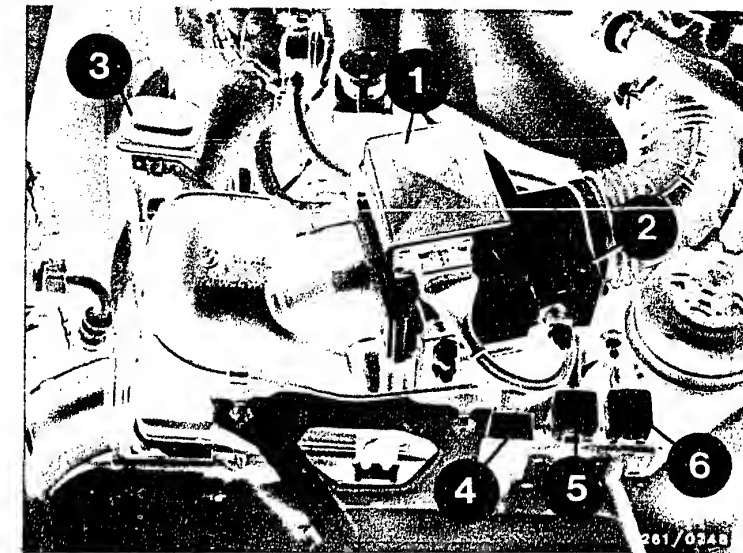
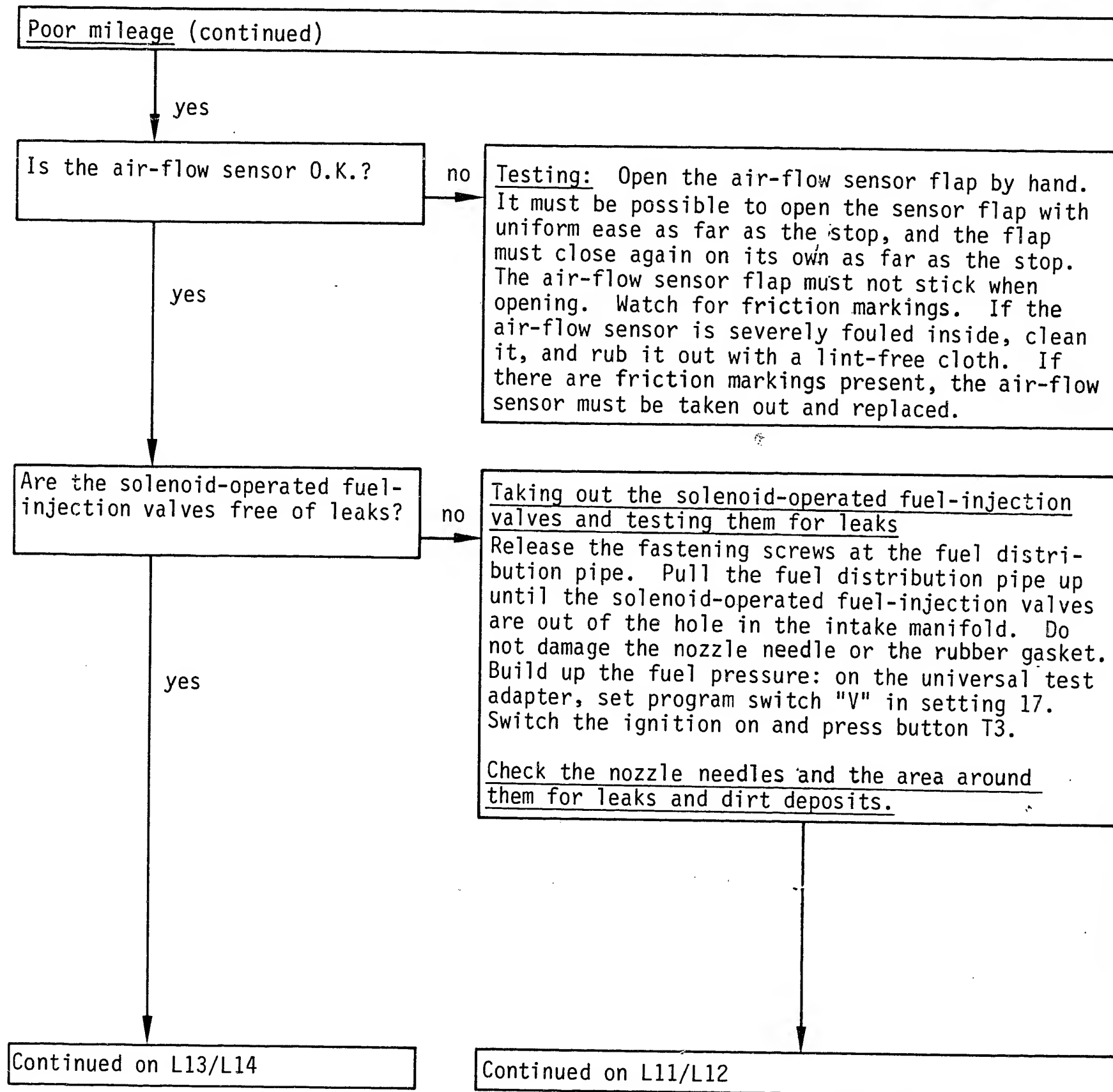
L6

Poor mileage  
BMW 325e (USA)



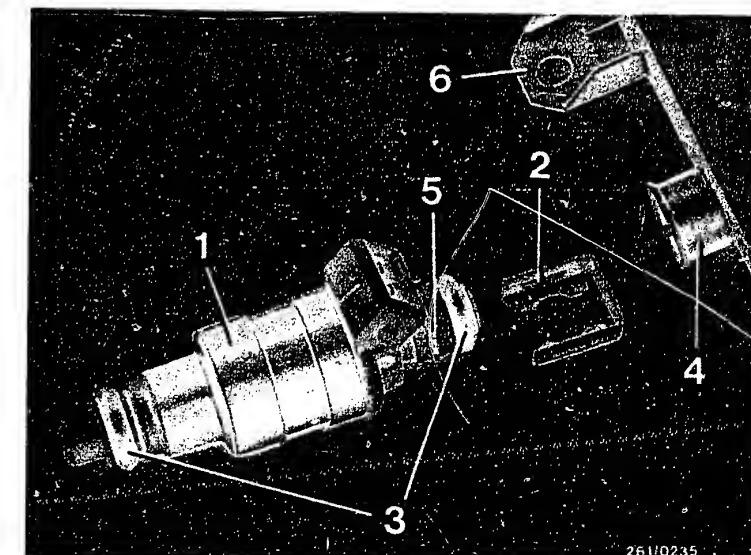


1 = Idle actuator  
2 = Start valve



- 1 = Air-flow sensor with NTC I  
2 = Idle-mixture-adjusting screw

- 1 = Solenoid-operated fuel-injection valve  
2 = Holding bracket  
3 = Rubber gasket (O-ring)  
4 = Fuel distribution pipe connection  
5 = Slot  
6 = Fastening tab



**L9**

Poor mileage  
BMW 325e (USA)



**L10**

Poor mileage  
BMW 325e (USA)



yes

Disconnect the electrical connection.

Shove the holding bracket carefully out of the slot and pull the solenoid-operated fuel-injection valve out of the fuel distribution pipe connection.

Caution!

Catch any fuel that runs out. Do not allow it to drip on hot portions of the engine. Fire hazard!

Caution!

The protection sleeve must not be pried off.

### Installation of the solenoid-operated fuel-injection valves

Take out and replace damaged or swollen O-rings. Use set of parts 1 287 010 704.

Cut the lower O-ring (intake tube) into pieces.

Caution! Do not damage the protection sleeve.

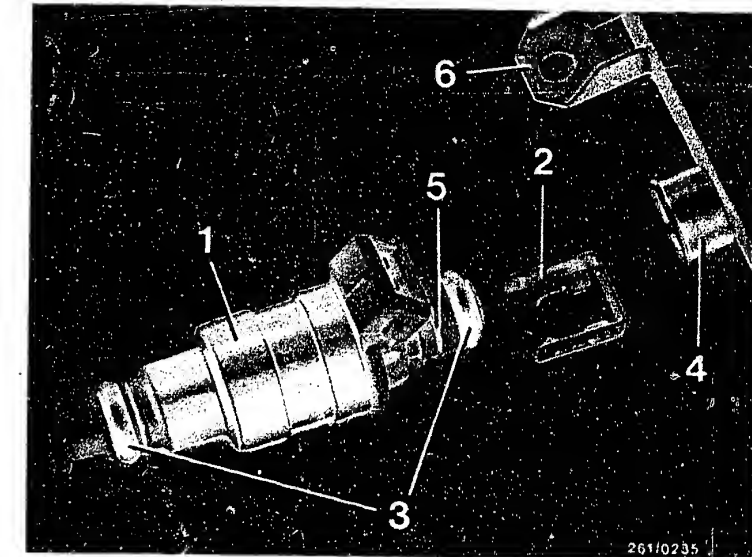
Pull a new O-ring over the protection sleeve and the shoulder on it. Do not damage any parts in so doing.

Before installation, check both rubber gaskets for proper seating. Fasten the solenoid-operated fuel-injection valves to the fuel distribution pipe. All solenoid-operated fuel-injection valves are to be pressed into the seats at the same time using the fuel distribution pipe. Screw the fuel distribution pipe tight. Check all air and fuel hoses for proper seating.

Make electrical connections.

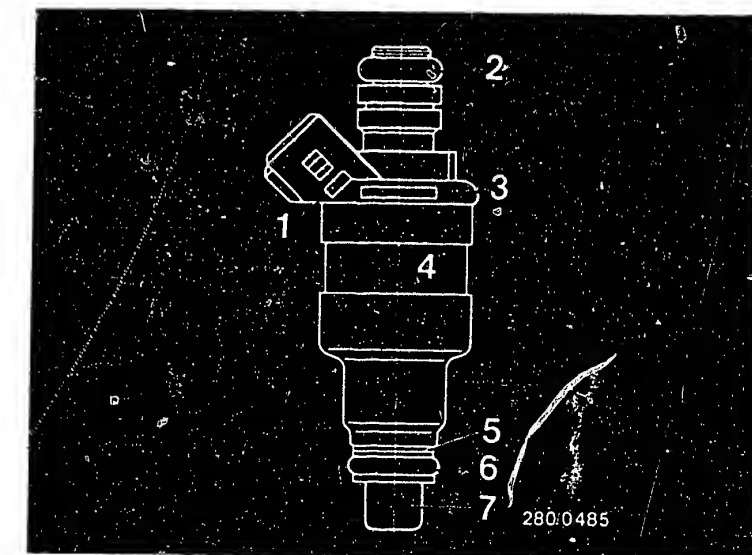
Start the engine and check that no unmetered air is being drawn in.

Continued on L13/L14



- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab

- 2 = Top O-ring
- 6 = Bottom O-ring
- 7 = Protective sleeve





## Poor mileage (continued)

yes

Idle speed with engine at normal operating temperature:  
650 ... 750 min<sup>-1</sup>

Measure the exhaust gas value with the engine at normal operating temperature in front of the catalytic converter:  
0.5 ... 0.8 vol. %CO

Before testing, disconnect the hose to the activated carbon filter, switch off the loads, and take apart the lambda sensor plug connection.

no

- The idle speed cannot be adjusted. It is permanently set in the idle speed control control unit, and is determined by the idle actuator.
- Adjust the exhaust gas using the idle-mixture-adjusting screw in the air-flow sensor. To do so, remove the plug using the special tool.

If the CO cannot be adjusted:

- If the CO-level is too low: repeat the leak test on the intake system.
- If the CO-level is too high: take out and replace the air-flow sensor.

Note:

After adjusting the CO-level, insert a new plug into the air-flow sensor.

yes

Checking the customer complaint

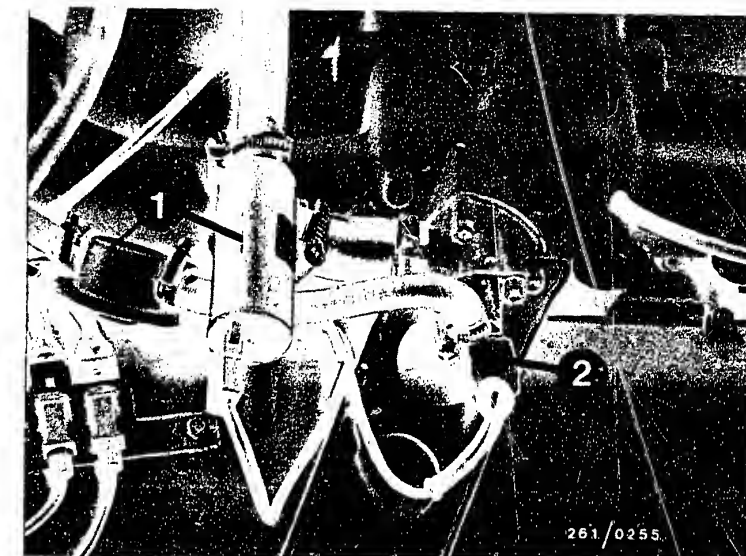
"Poor mileage"

has been completed.  
Has the customer complaint been corrected?

no

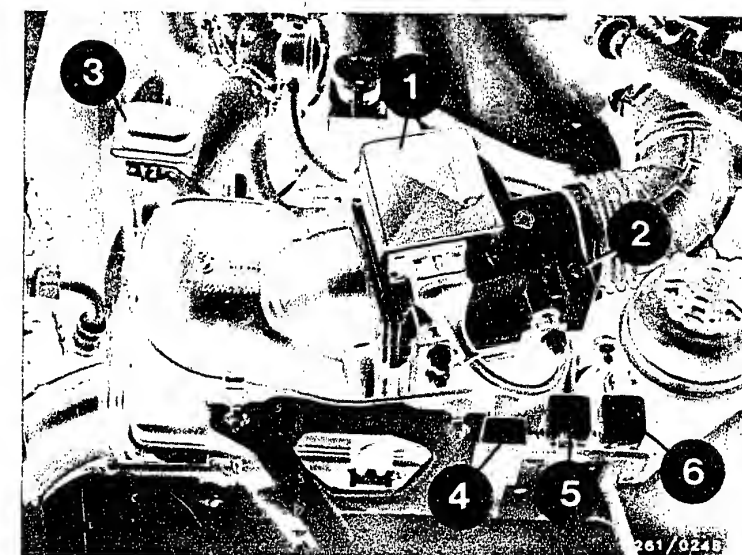
### Additional possible defects

- The customer complaint has been incorrectly identified. (See Coordinates C3 ... C10.) If the defect has not been identified using the "Target Trouble-Shooting", see "Detailed Trouble-Shooting" (Coordinates C3/C4).
- Engine is not O.K. mechanically. (Compression, valve setting, valve timing, wear on camshaft).



1 = Idle actuator  
2 = Start valve

1 = Air-flow sensor with NTC I  
2 = Idle-mixture-adjusting screw



**L13**

Poor mileage  
BMW 325e (USA)



**L14**

Poor mileage  
BMW 325e (USA)



# NO MAX. ENGINE POWER, AND/OR MAX. VELOCITY

## Trouble-shooting program according to customer complaint

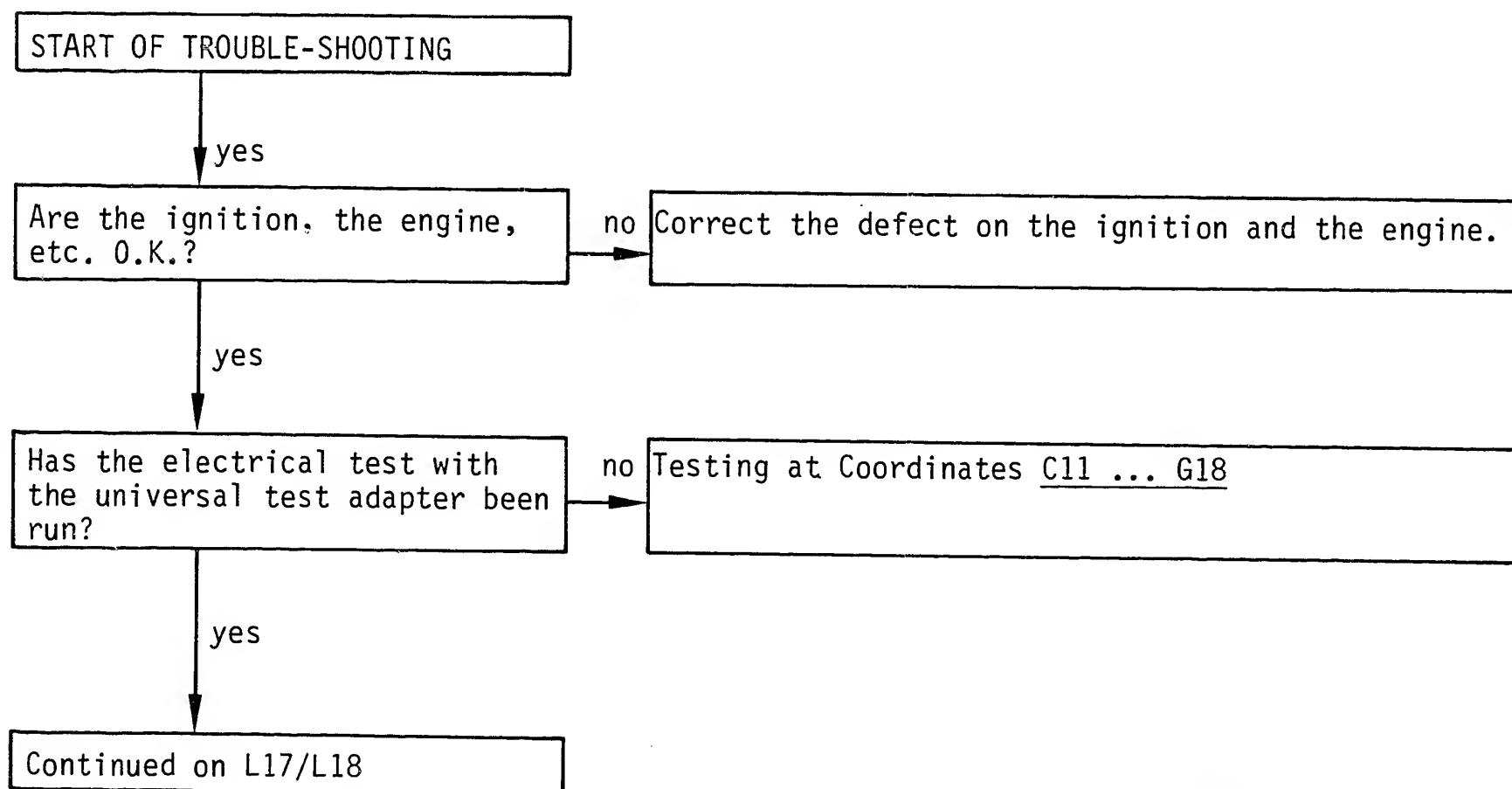
### How to use the program

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If it is possible to answer the questions clearly with "yes" even without testing, proceed to the next question below.

On the other hand, if the answer to the question is "no", and a defect is suspected, you must switch to the center column of boxes and carry through the tests indicated there. At the end of the test, the trouble-shooting is continued at that point at which the shift was made previously.



**L15**

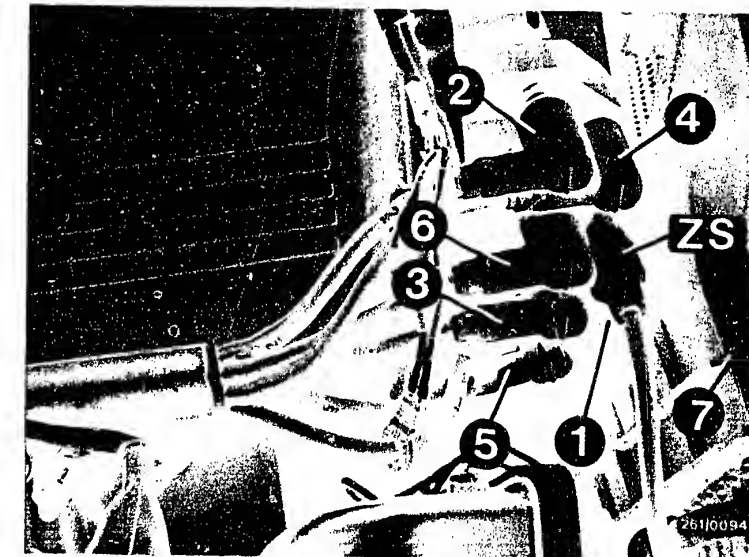
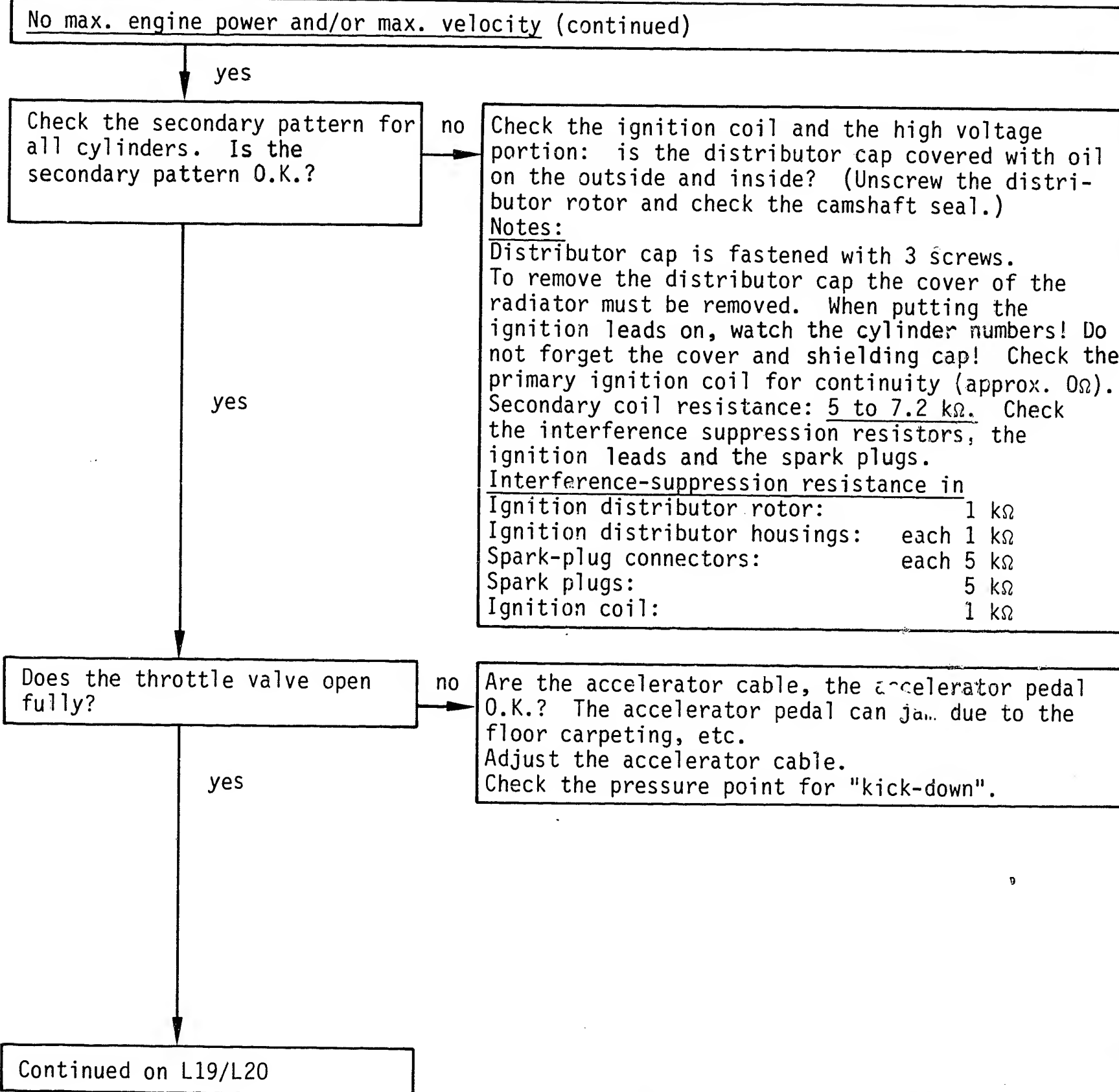
No max. engine power  
BMW 325e (USA)



**L16**

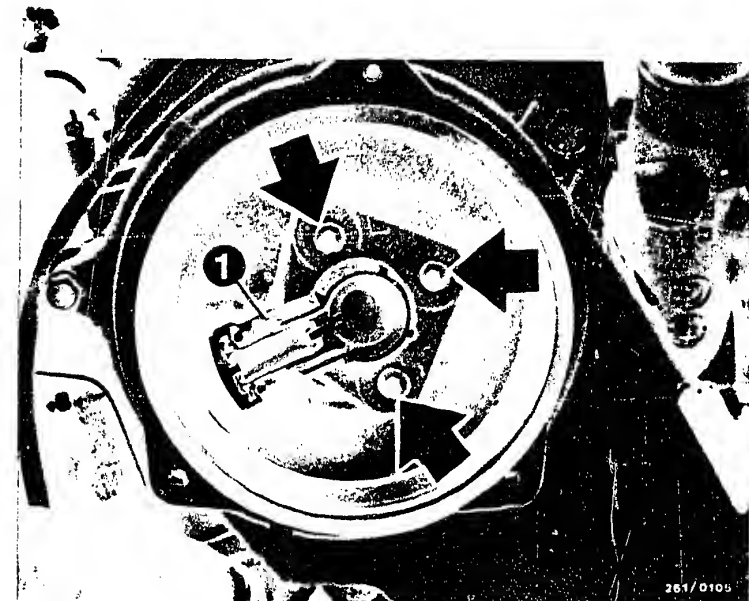
No max. engine power  
BMW 325e (USA)





High voltage distributor  
1 - 6 = Cylinder numbers  
ZS = High voltage lead to the  
ignition coil  
7 = Radiator cover

1 = Distributor rotor  
Arrow = Fastening screws



**L17**

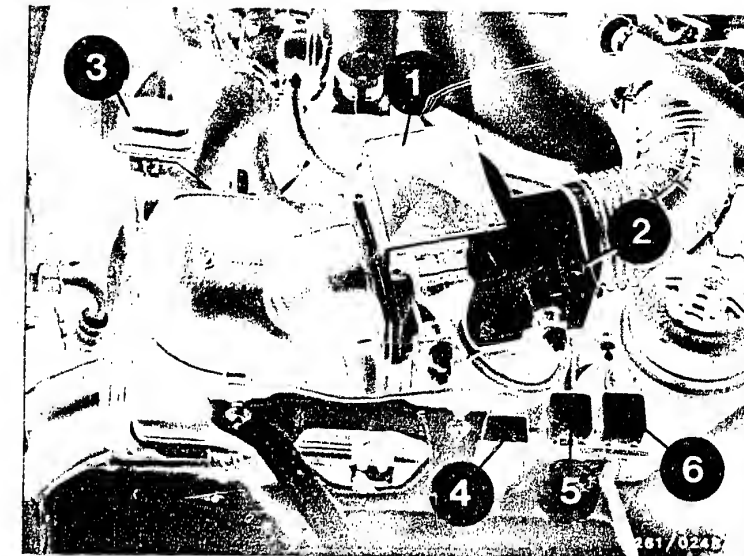
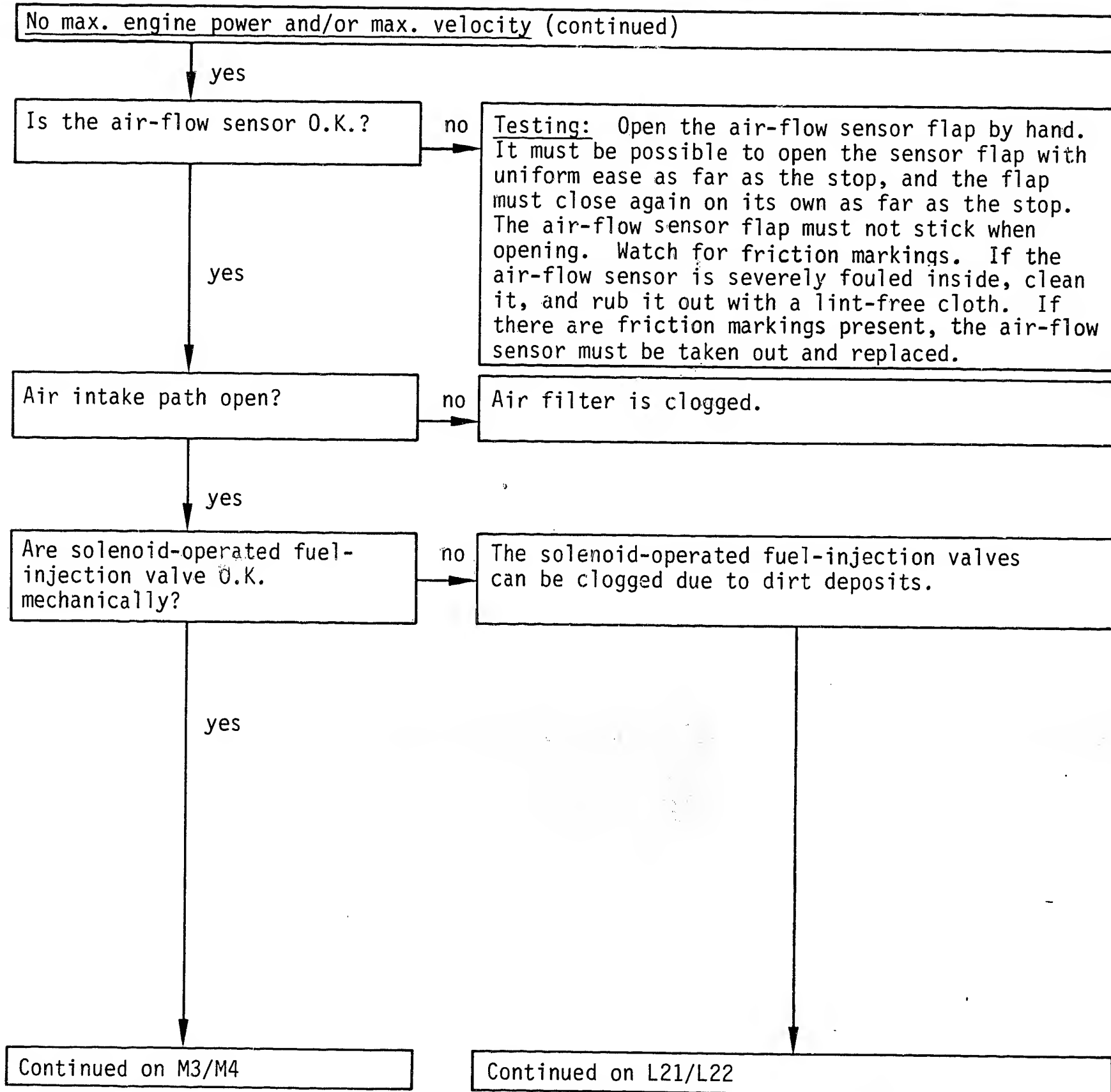
No max. engine power  
BMW 325e (USA)



**L18**

No max. engine power  
BMW 325e (USA)





1 = Air-flow sensor with NTC I  
2 = Idle-mixture-adjusting screw

**L19**

No max. engine power  
BMW 325e (USA)



**L20**

No max. engine power  
BMW 325e (USA)



No max. engine power and/or max. velocity (continued)

Taking out the solenoid-operated fuel-injection valves

Release the fastening screws on the fuel distribution pipe. Pull the fuel distribution pipe up until the solenoid-operated fuel-injection valves are out of the hole in the intake manifold. Do not damage the nozzle needles or the rubber gasket.

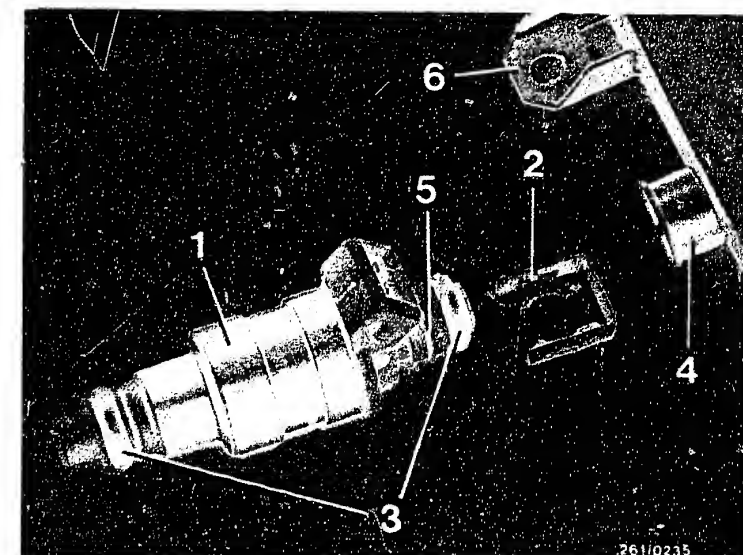
Check the nozzle needles and the area around them for tightness of seal and for dirt deposits. Disconnect the electrical connection. Carefully shove the holding bracket out of the slot and pull the solenoid-operated fuel-injection valve out of the fuel-distribution pipe connection.

yes

Continued on M3/M4

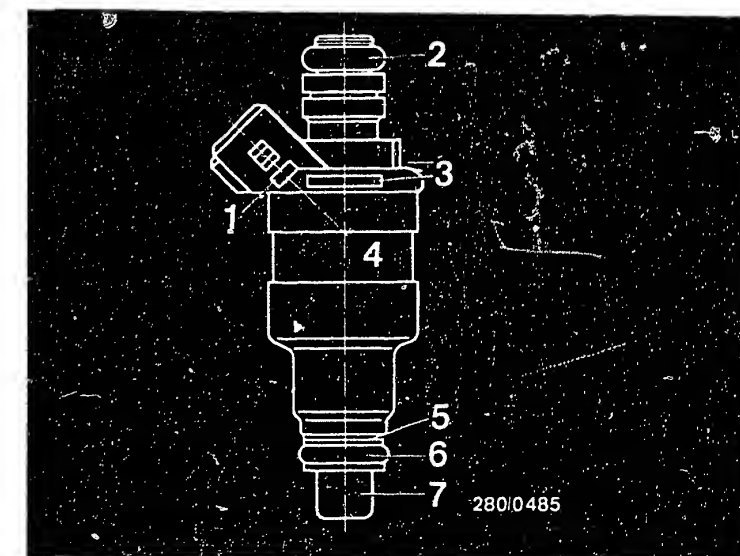
yes

Continued on M1/M2



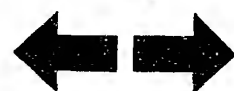
- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab

- 2 = Top O-ring
- 6 = Bottom O-ring
- 7 = Protection sleeve



**L21**

No max. engine power  
BMW 325e (USA)



**L22**

No max. engine power  
BMW 325e (USA)





No max. engine power and/or max. velocity (continued)

yes

**Caution!**

Catch any fuel that runs out. Do not allow it to drip on hot portions of the engine. Fire hazard!

**Caution!**

The protection sleeve must not be pried off.

Installation of the solenoid-operated fuel-injection valves

Take out and replace damaged or swollen O-rings.

Use set of parts 1 287 010 704.

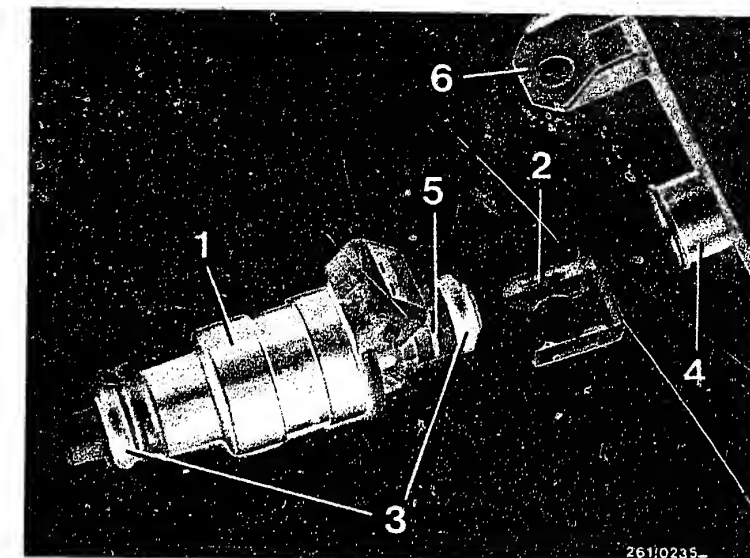
Cut the lower O-ring (intake tube) into pieces.

Caution! Do not damage the protection sleeve.

Pull a new O-ring over the protection sleeve and the shoulder on it. Do not damage any parts in so doing.

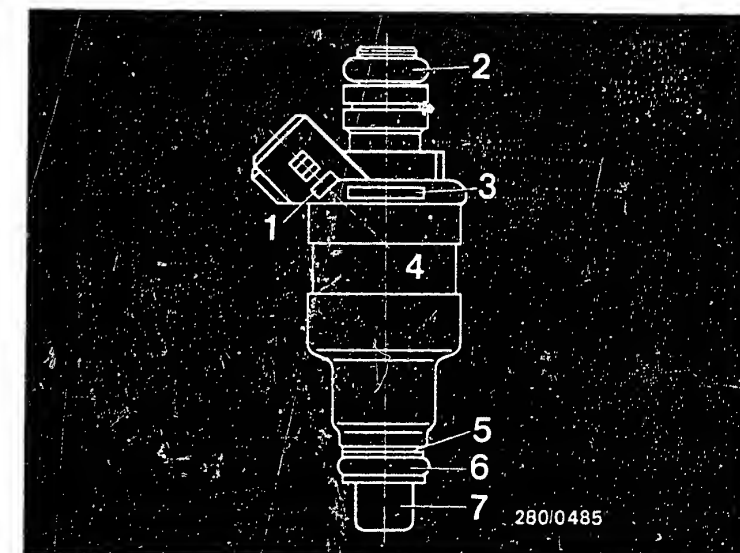
Before installation, check both rubber gaskets for proper seating. Fasten the solenoid-operated fuel-injection valves to the fuel distribution pipe. All solenoid-operated fuel-injection valves are to be pressed into the seats at the same time using fuel distribution pipe. Screw the fuel distribution pipe tight. Check all air and fuel hoses for proper seating. Make electrical connections.

Start the engine and check that no unmetered air is being drawn in.



- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket (O-ring)
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab

- 2 = Top O-ring
- 6 = Bottom O-ring
- 7 = Protection sleeve



Continued on M3/M4

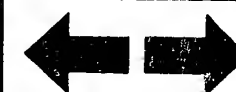
**M1**

No max. engine power  
BMW 325e (USA)



**M2**

No max. engine power  
BMW 325e (USA)



No max. engine power and/or max. velocity (continued)

yes

Is the fuel delivery O.K.?

no

yes

Measure the fuel delivery:

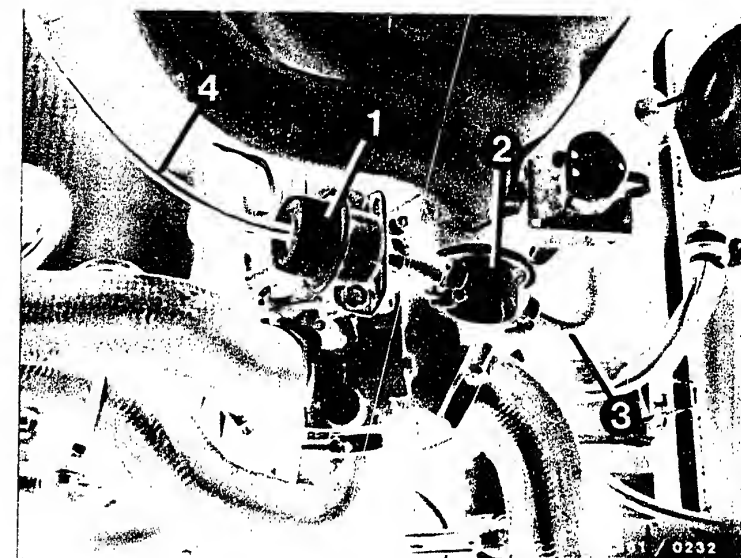
To test, release the connection between the fuel return hose (from the pressure regulator) and the fuel return line (to the fuel tank). If need be, extend the hose and direct into a 5 l container with measuring scale. Build up the fuel pressure: on the universal test adapter set the program switch "V" in setting 17. Switch the ignition on and press button T3.

Test specification: min. 750 cm<sup>3</sup>/30 s

Corrective action if the specification is not attained.

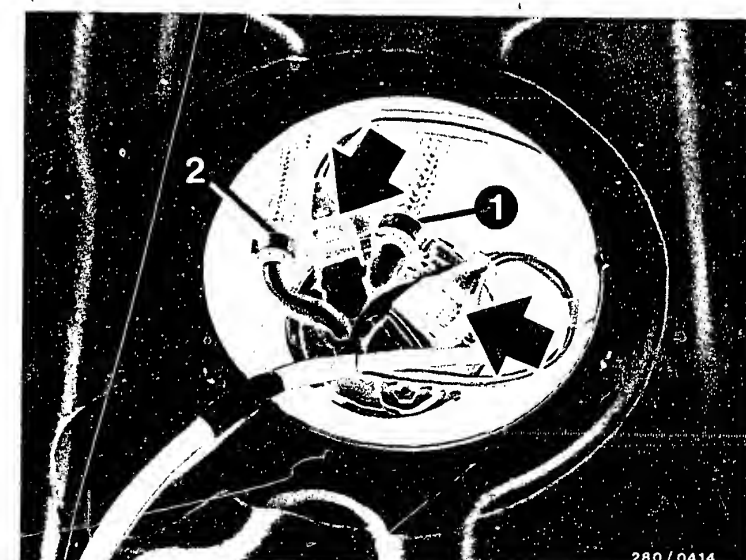
- Fuel filter is clogged: take it out and replace it.
- Is the voltage at the fuel pump plugs min. 12 V with the engine running? If not, clean the contacts. Eliminate any poor ground connection. Take out and replace the leads.
- Check the pre-supply pump. Check by listening: Disconnect the connecting plug at the electric fuel pump. Build up the fuel pressure: on the universal test adapter, set the program switch "V" in setting 17. Switch the ignition on and press button T3. The pre-supply pump must run. If not, check the connecting leads and if need be, take out and replace the pre-supply pump.

Continued on M5/M6



- 1 = Pressure regulator
- 2 = Fuel-line-pressure damper
- 3 = Fuel return line
- 4 = Air hose to the intake manifold

- 1 = Fuel delivery line to the electric fuel pump
- 2 = Fuel return line
- Arrows = Connection plug, 2-pole; pre-supply pump, 3-pole, immersion



**M3**

No max. engine power  
BMW 325e (USA)



**M4**

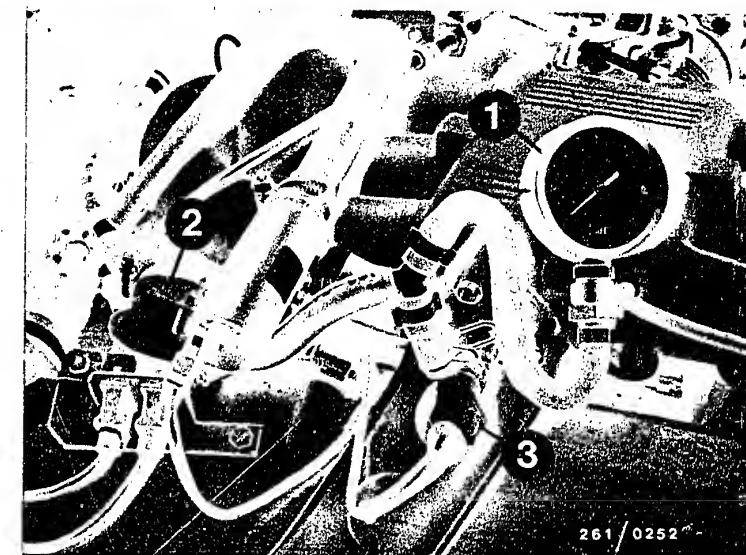
No max. engine power  
BMW 325e (USA)



No max. engine power and/or max. velocity (continued)

yes

- The fuel pressure regulator is defective: take it out and replace it. The fuel pressure regulator is fastened to the fuel distribution pipe using two fastening screws and across an O-ring. After the pressure regulator is taken out, the O-ring and the flat ring must be taken out and replaced. (Use set of parts 1 287 010 704).
- The fuel pump output is too low: take out and replace the fuel pump.
- Is the filter in the tank clogged? Is there corrosion in the tank?



1 = Pressure gauge  
2 = Fuel-line-pressure damper  
in the fuel delivery line  
3 = Start valve

Is the fuel pressure at full load O.K.?

no

Put a pressure gauge into the fuel distribution pipe (delivery line).

Caution:

Catch any gasoline that runs out. Fire hazard with engine hot and electrical sparks!

Have engine run at idle: fuel pump pressure approx. 2.0 bar.

Disconnect the air hose to the intake manifold at the pressure regulator:

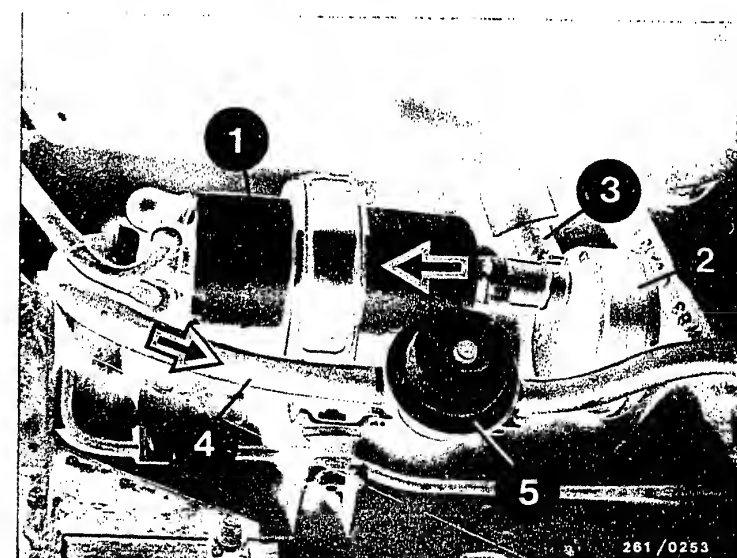
Fuel pump pressure: 2.3 ... 2.7 bar.  
(The reading may fluctuate slightly.)

Plug the air hose back on. Check the fuel pressure at nominal engine speed and nominal power output on the chassis dynamometer:

Fuel pressure at full load:  
2.3 ... 2.7 bar. (Reading may fluctuate slightly.)

yes

1 = Electric fuel pump  
2 = Fuel spinner  
3 = Fuel intake line  
4 = Fuel delivery line  
5 = Fuel-line-pressure damper  
Arrows = Direction of fuel flow



Continued on M9/M10

Continued on M7/M8

**M5**

No max. engine power  
BMW 325e (USA)



**M6**

No max. engine power  
BMW 325e (USA)

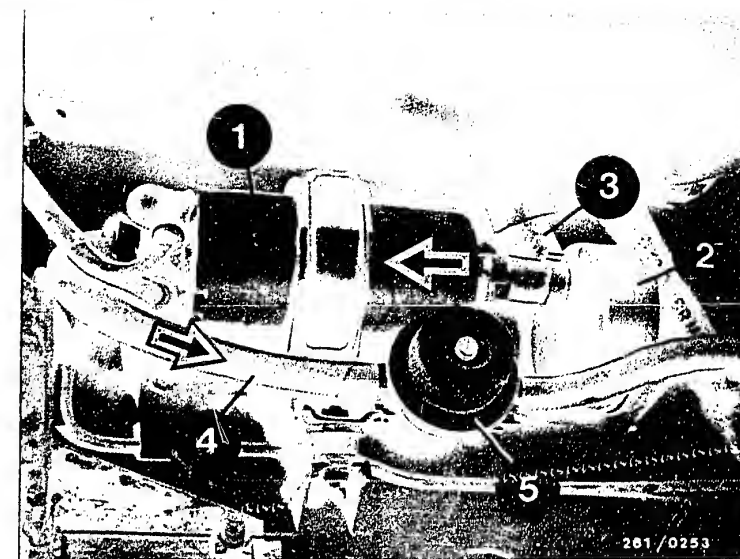


No max. engine power and/or max. velocity (continued)

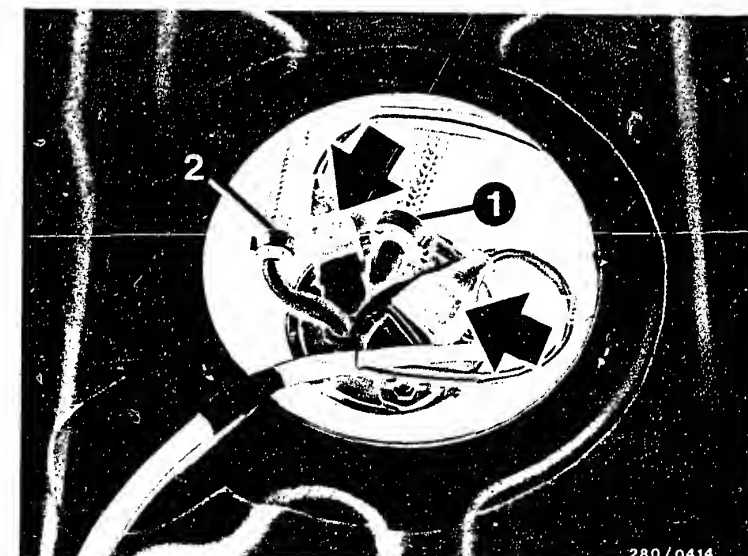
yes

Trouble-shooting:

- Fuel filter is clogged: take it out and replace it.
- Is the voltage at the fuel pump plugs min. 12 V with the engine running? If not, clean the contacts. Eliminate any poor ground connection. Take out and replace the leads.
- Check the pre-supply pump. Check by listening: Disconnect the connecting plug at the electric fuel pump. Build up the fuel pressure: on the universal test adapter, set the program switch "V" in setting 17. Switch the ignition on and press button T3. The pre-supply pump must run. If not, check the connecting leads and if need be, take out and replace the pre-supply pump.
- The fuel pressure regulator is defective: take it out and replace it.  
The fuel pressure regulator is fastened to the fuel distribution pipe using two fastening screws and across an O-ring. After the pressure regulator is taken out, the O-ring and the flat ring must be taken out and replaced. (Use set of parts 1 287 010 704).
- The fuel pump output is too low: take out and replace the fuel pump.
- Is the filter in the tank clogged? Is there corrosion in the tank?



- 1 = Electric fuel pump  
2 = Fuel spinner  
3 = Fuel intake line  
4 = Fuel delivery line  
5 = Fuel-line-pressure damper  
Arrows = Direction of fuel flow  
1 = Fuel delivery line to the electric fuel pump  
2 = Fuel return line  
Arrows = Connection plug, 2-pole: pre-supply pump, 3-pole, immersion tube sensor



Continued on M9/M10

**M7**

No max. engine power  
BMW 325e (USA)



**M8**

No max. engine power  
BMW 325e (USA)



No max. engine power and/or max. velocity (continued)

yes

Are all the hose lines and electrical lead connections put on correctly? Visual inspection. Has the intake system been checked for leaks?

no

Check that the hoses on the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace the hoses. Eliminate leaks by using new gaskets or by tightening the connecting screws.

Testing for leaks: Seal off the exhaust pipe and the air inlet point on the air filter. Disconnect the hose between the air-flow sensor and the idle actuator at the air-flow sensor. Seal off the hose opening to the idle actuator and using a compressed air gun (0.3 bar gauge pressure), blow into the intake manifold. In so doing, open the throttle valve fully. Brush or spray soapy water on all joints after the air-flow sensor flap. Bubbling or foaming indicates leaks. Check electrical plug contacts for loose contacts.

yes

Checking the customer complaint

"No max. engine power"

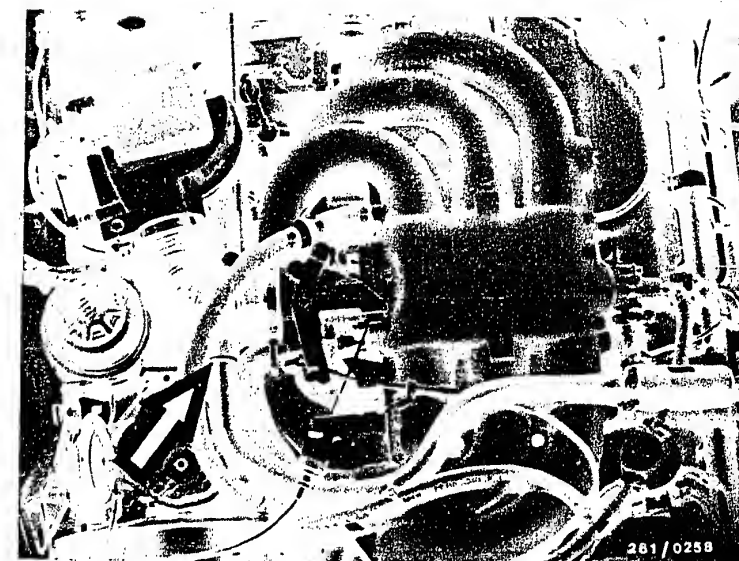
has been completed.

Has the customer complaint been corrected?

no

Additional possible defects

- The customer complaint has been incorrectly identified. (See Coordinates C3 ... C10.) If the defect has not been identified using the "Targeted Trouble-Shooting" see "Detailed Trouble-Shooting" (Coordinates C3/C4).
- Engine is not O.K. mechanically. (Compression, valve setting, valve timing, wear on camshaft).



Arrow = Disconnect hose here for leak test.

**M9**

No max. engine power

BMW 325e (USA)



**M10**

No max. engine power

BMW 325e (USA)





## CO-LEVEL AT IDLE TOO LOW OR TOO HIGH

Trouble-shooting program according to customer complaint

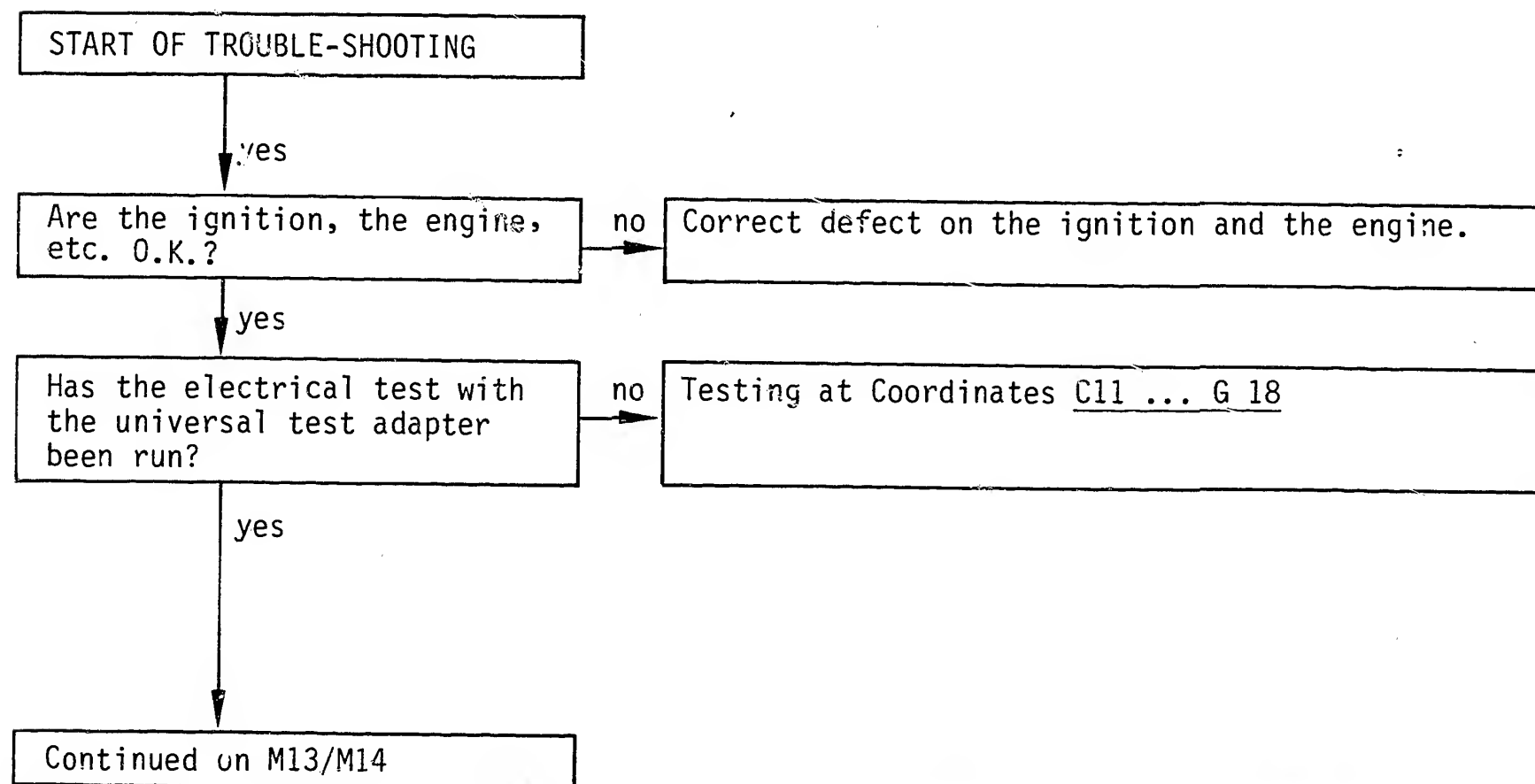
How to use the program

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- The column at the right shows the figures belonging to the text and the legend for the figures.

If it is possible to answer the questions clearly with "yes" even without testing, proceed to the next question below.

On the other hand, if the answer to the question is "no", and a defect is suspected, you must switch to the center column of boxes and carry through the tests indicated there. At the end of the test, the trouble-shooting is continued at that point at which the shift was made previously.



**M11**

CO-adjustment  
BMW 325e ( USA )



**M12**

CO-adjustment  
BMW 325e (USA)



# CO-level at idle too low or too high (continued)

yes

Check the secondary pattern for all cylinders. Is the secondary pattern O.K.?

no

Check the ignition coil and the high voltage portion: is the distributor cap covered with oil on the outside and inside? (Unscrew the distributor rotor and check the camshaft seal)

## Notes:

Distributor cap is fastened with 3 screws. To remove the distributor cap the cover of the radiator must be removed. When putting the ignition leads on, watch the cylinder numbers! Do not forget the cover and shielding cap! Check the primary ignition coil for continuity (approx. 0Ω). Secondary coil resistance: 5 to 7.2 kΩ. Check the interference suppression resistors, the ignition leads, and the spark plugs.

## Interference-suppression resistance in

Ignition distributor rotor:	1 kΩ
Ignition distributor housings:	each 1 kΩ
Spark-plug connectors:	each 5 kΩ
Spark plugs:	5 kΩ
Ignition coil:	1 kΩ

yes

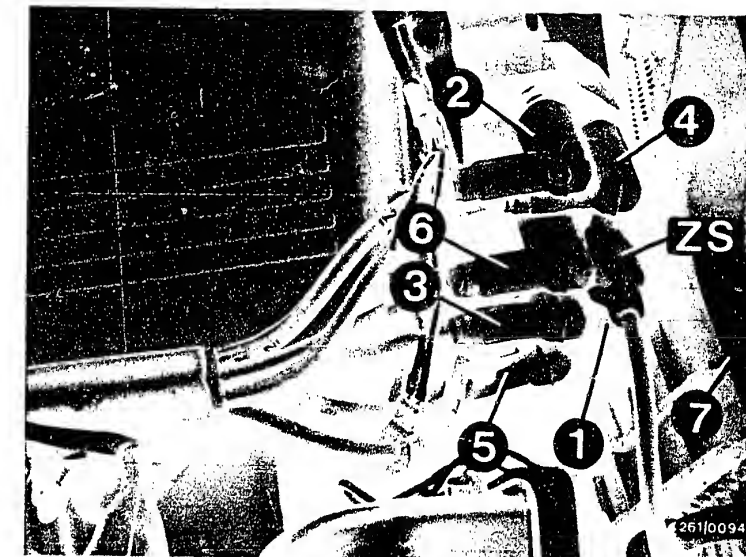
Is the air-flow sensor O.K.?

no

Testing: Open the air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease as far as the stop, and the flap must close again on its own as far as the stop. The air-flow sensor flap must not stick when opening. Watch for signs of grinding. If the air-flow sensor is severely fouled inside, clean it, and rub it out with a lint-free cloth. If there are signs of grinding present, the air-flow sensor must be taken out and replaced.

yes

Continued on M15/M16



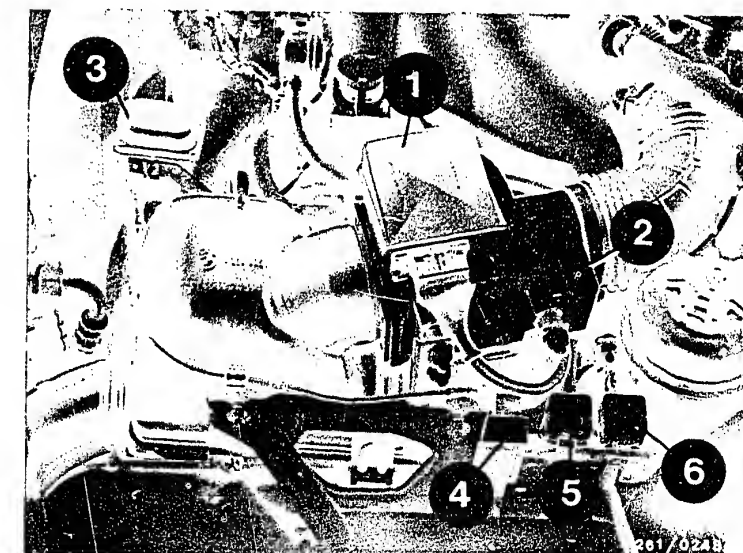
## High voltage distributor

1 - 6 = Cylinder numbers

ZS = High voltage lead to the ignition coil

7 = Radiator cover

1 = Air flow sensor with NTC I  
2 = Idle-mixture-adjusting screw



**M13**

CO-adjustment  
BMW 325e (USA)



**M14**

CO-adjustment  
BMW 325e (USA)



CO-level at idle too low or too high (continued)

yes

Is the start valve O.K.?  
(Test for leaks)

no

Check the start valve for leaks:

1. In the engine

Clamp off the fuel delivery line at the start valve. If the engine then runs smooth, take out and replace the start valve.

2. Taken out of the engine

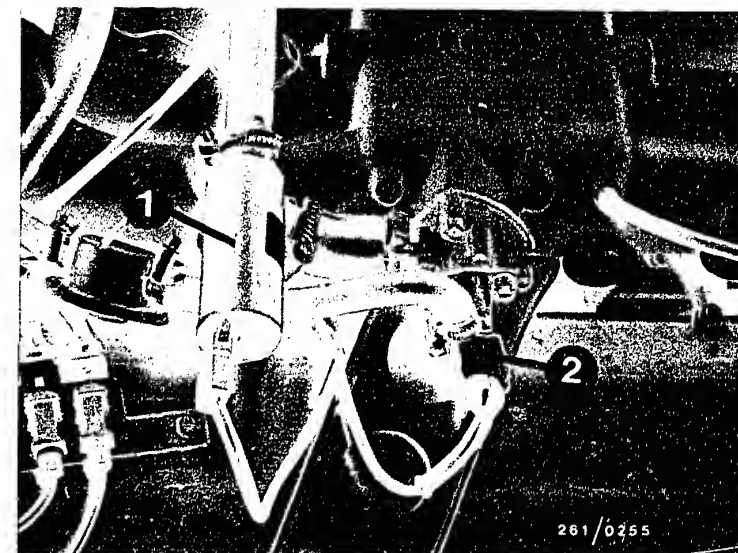
Take out the start valve. (Caution: fire hazard!) The fuel and the electrical lines remain connected. (Place a catch basin under the start valve.)

Build up the fuel pressure: on the universal test adapter, set the program switch "V" at setting 17. Switch ignition on, and press button T3.

Test specification: the formation of max. 1 drop is permissible at the opening of the valve within one minute.

yes

Continued on M17/M18



1 = Idle actuator  
2 = Start valve

**M15**

CO-adjustment  
BMW 325e (USA)



**M16**

CO-adjustment  
BMW 325e (USA)



CO-level at idle too low or too high (continued)

yes

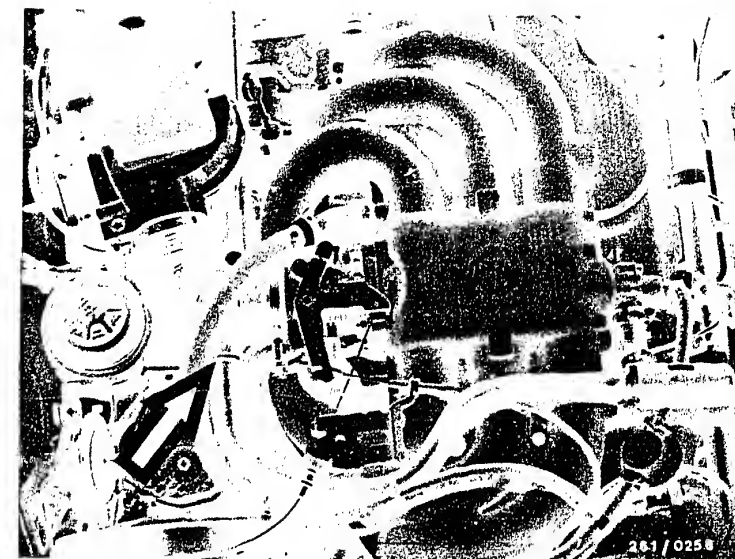
Are all the hose lines and electrical lead connections put on correctly? Visual inspection. Has the intake system been checked for leaks?

no

Check that the hoses on the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace the hoses. Eliminate leaks by using new gaskets or by tightening the connecting screws. Testing for leaks: Seal off the exhaust pipe and the air inlet point on the air filter. Disconnect the hose between the air-flow sensor and the idle actuator at the air-flow sensor. Seal off the hose opening to the idle actuator and using a compressed air gun (0.3 bar gauge pressure), blow into the intake manifold. In so doing, open the throttle valve fully. Brush or spray soapy water on all joints after the air-flow sensor flap. Bubbling or foaming indicates leaks. Check electrical plug contacts for loose contacts.

yes

Continued on M19/M20



Arrow = Disconnect hose here for leak test.

**M17**

CO-adjustment  
BMW 325e (USA)



**M18**

CO-adjustment  
BMW 325e (USA)



CO-level at idle too low or too high (continued)

yes

Exhaust gas test with CO-tester with engine at normal operating temperature. Loads switched off.

Specified value:  
0.5 ... 0.8 vol. %CO

(Measured in front of the catalytic converter, with the lambda sensor plug connection taken apart and the hose to the activated-carbon filter removed).

no

Remove the plug in the air-flow sensor using the special tool.

- CO-adjustment too low:  
Adjust the bypass screw in the air-flow sensor step-by-step in a clockwise direction (turning to right).
- CO-adjustment too high:  
Adjust the bypass screw in the air-flow sensor step-by-step in a counterclockwise direction (turning to left).

After completion of the adjustment, put in a new plug.

yes

Checking the customer complaint

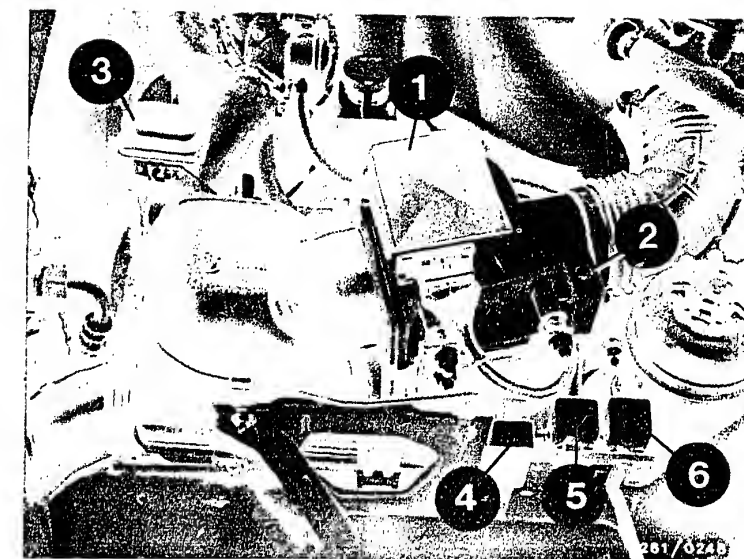
"CO-adjustment at idle too low or too high"

has been completed.  
Has the customer complaint been corrected?

no

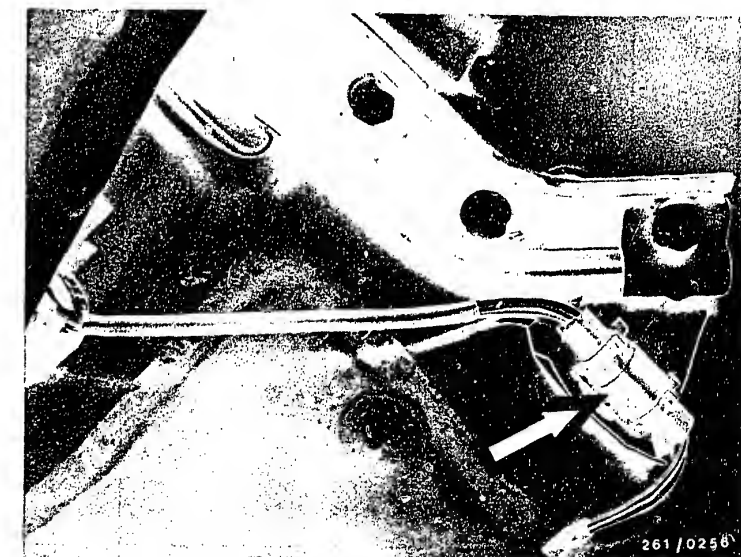
Additional possible defects

- The customer complaint has been incorrectly identified. (See Coordinates C3 ... C10.) If the defect has not been identified using the "Targeted Trouble-Shooting" see "Detailed Trouble-Shooting" (Coordinates C3/C4).
- Engine is not O.K mechanically. (Compression, valve setting, valve timing, wear on camshaft).



1 = Air-flow sensor with NTC I  
2 = Idle-mixture-adjusting screw

Arrow = Plug connection for the lambda sensor



**M19**

CO-adjustment  
BMW 325e (USA)



**M20**

CO-adjustment  
BMW 325e (USA)





# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party

13...39

VDT-I-261/102 En

6.1983

PARTS SET FOR SOLENOID-OPERATED INJECTION VALVES

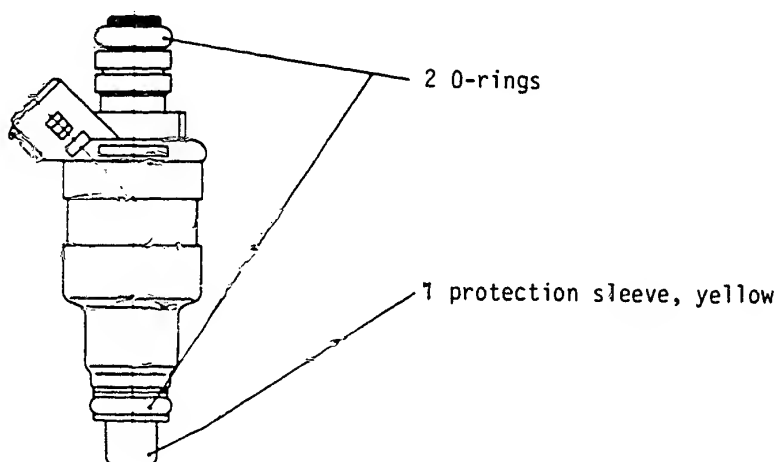
Supersedes 8.1982 edition

0 280 150 2..

AND PRESSURE REGULATORS 0 280 160 2..

A common parts set is available for the Motronic solenoid-operated injection valves and pressure regulators with the new method of connection.

Contents for 1 injection valve:



Contents for pressure regulator:

1 O-ring  
1 supporting plate

Since the above-mentioned parts are subjected to extreme temperature stress, they should be exchanged for new parts whenever servicing is carried out.

"Unmetered air" sucked in through injection-valve seals which are not tight, is a frequent case for servicing.

The parts set has the part number 1 287 010 704 and will in future be listed in the service parts microfiche under solenoid-operated injection valves (see EE 00 under 0 280..).

Please direct questions and comments concerning the contents to our authorized representative in your country.

**BOSCH**

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**N1**

Technical Bulletin

BMW 325e (USA)



# Technical Bulletin

Only for use within the Bosch organization. No to be communicated to any third party.

28

PLUG CONNECTORS FOR  
JETRONIC COMPONENTS  
Parts sets

VDT-I-280/111 En

11.1984

(supersedes edition 11.1982)

Parts sets are available for replacement of Jetronic plug connectors. These consist of:

- Plug connector housing
- Protective cap (rubber sleeve)
- Contact springs

These parts are listed on microfiche EE...\*.

\* see microfiche EE00 under 0 280 ..

- Plug, black, 2-pin,  
parts set 1 287 013 002 cable connector in conjunction with socket, 2-pin
- Socket, black, 2-pin,  
parts set 1 287 013 001 for e.g.

Temperature sensor	0 280 130 0..
Auxiliary-air device	0 280 140 ..
Thermo-time switch	0 280 130 2..
Start valve	0 280 170 ..
Warm-up regulator	0 438 140 ..

- Socket, grey, 2-pin  
parts set 1 287 013 003 for:

Solenoid-operated injection valve	0 280 150 ..
--------------------------------------	--------------

**N2**

Technical Bulletin

BMW 325e (USA)



- Socket, black, 3-pin,  
parts set 1 237 000 039 for:

Throttle-valve switch 0 280 120 ..

- Socket, black, 5-pin,  
parts set 1 287 013 006 for:

Air-flow sensor 0 280 20. ..  
(LE version)

- Socket, black, 6-pin,  
parts set 1 287 013 004 for

Air-flow sensor 0 280 200 ..

- Socket, black, 7-pin,  
parts set 1 287 013 005 for:

Air-flow sensor 0 280 20. ..  
Air-mass sensor 0 280 211 ..

- Wiring-harness plug connector, black, 25-pin  
parts set 1 287 013 009 for:

Control unit 0 280 0..

- Wiring-harness plug connector, black, 35-pin,  
parts set 1 287 013 008 for:

Control unit 0 280 0..

The contact springs (minitimers) are also available separately under part no. 1 284 477 026.

The plug-connector housings are only available in the stated colours.

Responsible:

Robert Bosch GmbH

Division KH

Technical After-Sales Service (KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country.



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